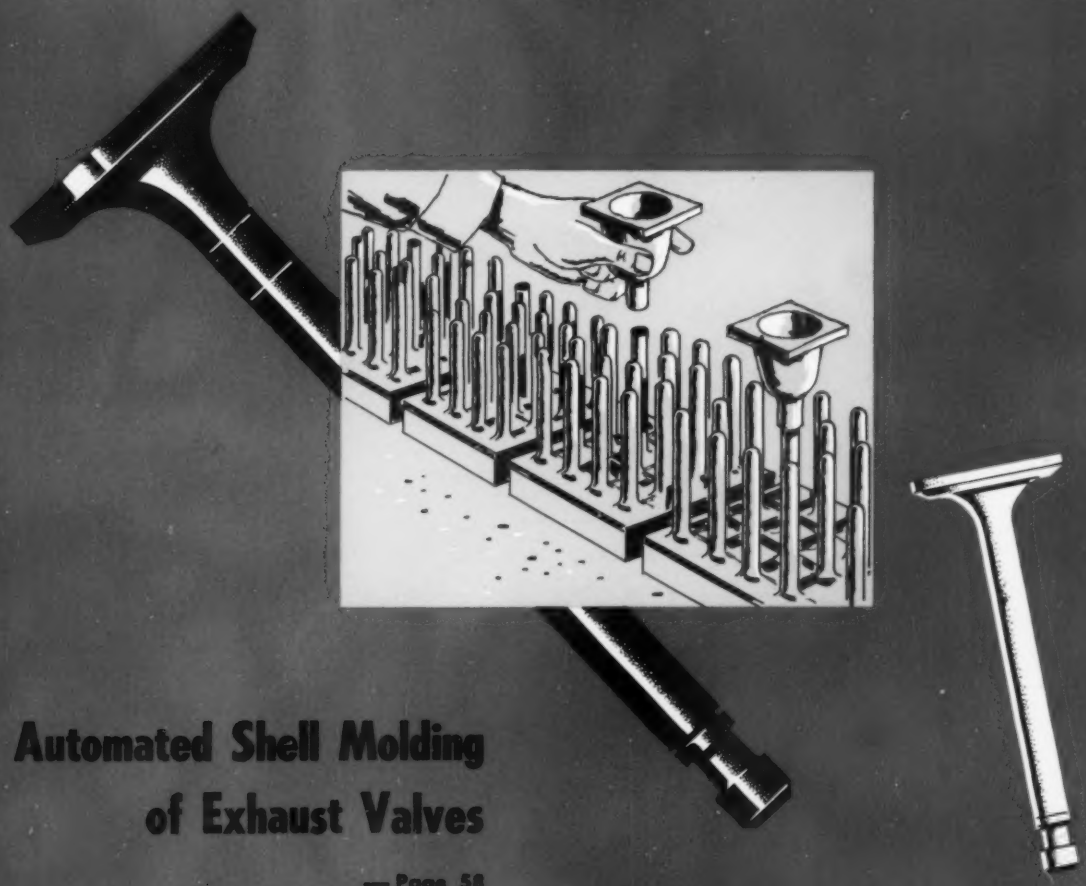
APRIL
1961

FOUNDRY

A PENTON PUBLICATION



Automated Shell Molding of Exhaust Valves

— Page 58

CONTENTS — Pages 3-4

How To Save Metal in the Brass Foundry
— Page 65

Improved Method for Foundry Estimating
— Page 73

Gating Technique Opposes Old Theories
— Page 81

Handling Foundry Sand by Air Conveyors
— Page 76

METALGRAMS

. . . news of "Electromet" ferroalloys and metals

UNION CARBIDE METALS

APRIL, 1961

STEEL CASTING QUALITY IMPROVED -- "To meet our quality standards, we have developed a furnace practice that yields P values greater than 75 for Grade B steel," said Harrison Steel Castings Co., Attica, Ind. "Calcium-manganese-silicon helps us get consistently high reduction-in-area values. These in turn raise P values well over 75 -- our minimum quality requirement." Harrison's practice: 4 lb. ferrotitanium and 4 lb. calcium-manganese-silicon per ton for acid open-hearth steel. 3 lb. aluminum and 4 lb. calcium-manganese-silicon per ton for acid-electric steel (until conversion of furnaces to basic). Results: improved fluidity, ductility, and low-temperature impact strength.

* * *

RESULTS TELL STORY -- In 1959, Harrison made 2,028 tests on Grade B steel made in the acid open-hearth. Average P value was 81.8 (76,499 psi tensile strength and 55.4 per cent reduction-in-area). Average impact strength at -20 deg. F. was 17.6 ft.-lb. Similarly high results have been obtained on steel made in the acid electric furnace. For more details, write for the article, "Ca-Mn-Si Boosts Casting Quality," in the Winter-Spring 1961 issue of UNION CARBIDE METALS REVIEW.

For more information circle 551 on page 39

* * *

SULPHUR CONTROL IN CAST IRON -- Because foundry coke and scrap introduce sulphur, cast iron often contains up to 0.12 per cent or more sulphur. In the absence of enough manganese, iron sulphide forms, reducing machinability and causing misrun castings. Managanese forms manganese sulphide instead. This compound has little effect on properties, removing the adverse effects of sulphur. A 6-to-1 manganese-sulphur ratio insures sulphur neutralization. Convenient additions of "FM" ferromanganese or silicomanganese briquets to the cupola are widely used for sulphur control. For briquet specifications, write for F-20,066.

For more information circle 552 on page 39

* * *

A WORLD-WIDE SEARCH -- The search never ends for high-grade ores, from which ferroalloys are made. Exploration teams of Union Carbide Ore Company search all parts of the world -- sometimes through tropical jungles, arid deserts, and unexplored rivers. Their goal: to discover new deposits to satisfy the growing demand for ferroalloys. Union Carbide's integrated mine-to-furnace operations assure a continuous supply of ferroalloys...when you want them. For the full story, write for the article, "From Earth to Hearth," in the Winter-Spring 1961 issue of UNION CARBIDE METALS REVIEW.

For more information circle 553 on page 39

* * *

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Union Carbide Canada Ltd., Toronto.

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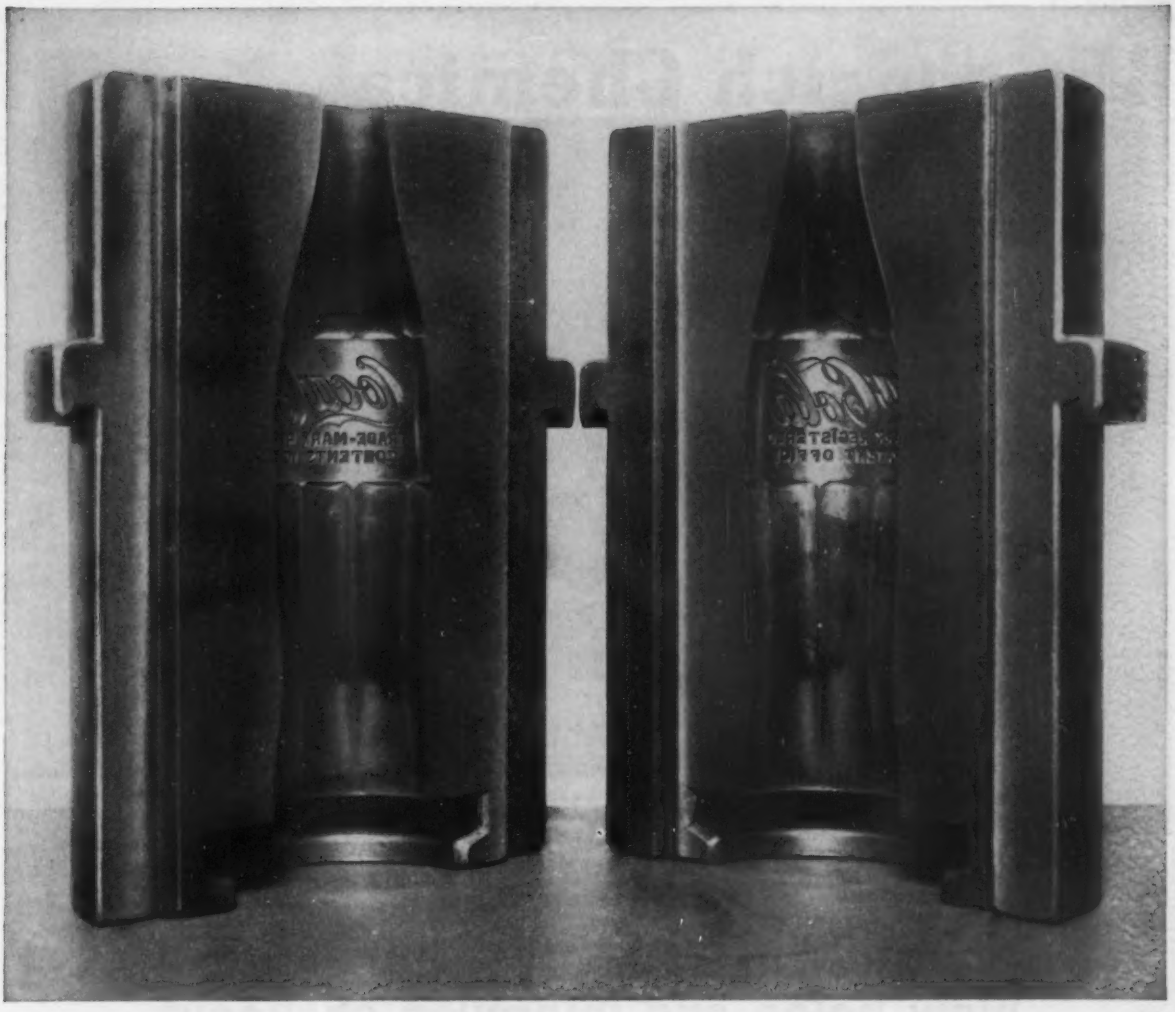

Nickel cast iron helps Coke get better bottles at lower cost

Demonstrates advantages of nickel-alloyed iron for foundrymen and users of castings

Bottles for Coca-Cola* are made in nickel cast iron molds for two important reasons. Nickel cast iron molds have the right combination of engineering properties to assure bottles of a high quality. And nickel cast iron molds have the stamina and strength to assure a long service life...as many as 40,000 gross of bottles per mold.

You and your customers benefit when you add nickel to iron castings

Nickel helps give Coca-Cola bottle molds a dense, close-grained structure . . . particularly on the chilled cavity which comes in contact with molten glass. And by giving you, the foundrymen, better control over castings, nickel helps you cut castings rejects to a minimum.

Your customers also benefit from nickel cast iron's superior strength and resistance to wear, erosion and cracking. Nickel cast iron bottle molds retain their dimensional stability under cyclic heating and cooling. They resist scaling and wear. As a result, the castings-user gets longer service life from nickel cast iron, with lower maintenance and replacement costs.

Write Inco for helpful information

Whether you make glass molds or any other type of iron castings, there's a good chance that nickel can help you improve them. For detailed information on the family of nickel cast irons, just drop a note to Inco, c/o Foundry Industry Manager, outlining your problems with iron castings. Perhaps Inco nickel and Inco Research can help you solve them.

*"Coke" and "Coca-Cola" are registered trademarks of The Coca-Cola Company.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

For More Information Circle 556, Page 39

News about

B.F.Goodrich Chemical *raw materials*

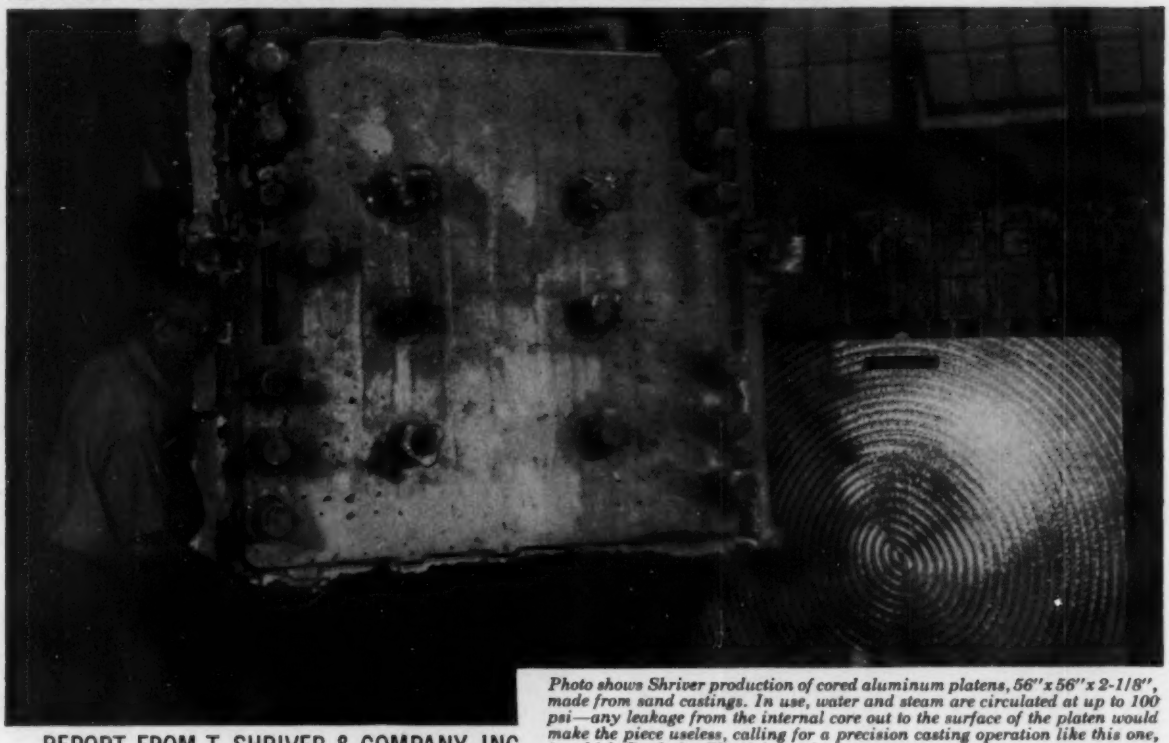

Photo shows Shriver production of cored aluminum platens, 56"x56"x2-1/8", made from sand castings. In use, water and steam are circulated at up to 100 psi—any leakage from the internal core out to the surface of the platen would make the piece useless, calling for a precision casting operation like this one, in which Good-rite CB-40 is used.

REPORT FROM T. SHRIVER & COMPANY, INC

New Good-rite CB-40 eliminates blow holes and improves shakeout

Another outstanding performance report on the new low-gassing mold and core binder. Here's what happened at T. Shriver & Company, Inc., Harrison, New Jersey.

Sounder castings. You can see what a problem blow holes might be with the kind of castings produced by T. Shriver. As the picture shows, there are large surface areas, small cross-sections and extremely thin walls. CB-40, with its exceptionally low gas, insures sounder castings—blow holes are practically eliminated.

Easier shakeout. The same thing goes for shakeout. Because of the controlled rate of collapse, shakeout is far easier regardless of the size of the casting; yet there is no burn-in. It's what leads T. Shriver to report: "We find sand very easy to remove."

Cuts drying time. Again from T. Shriver & Company: "We've learned that Good-rite CB-40 makes both time and oven temperature less critical." Good-rite CB-40 can be used with any present method of baking. It is safe at all stages and is non-inflammable, releasing no objectionable fumes.

Smoother finishes. Many foundries are learning that use of Good-rite CB-40 permits use of finer sands, producing smoother finishes and eliminating much machining. There is excellent dimensional stability in the core, resulting in far closer tolerances in casting.

More information. To learn more about how you can improve your castings with Good-rite CB-40 and cut costs too, write Dept. PD-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Good-rite CHEMICALS

B. F. Goodrich Chemical Company
a division of The B. F. Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

April 1961
Volume 89—Number 4

FOUNDRY
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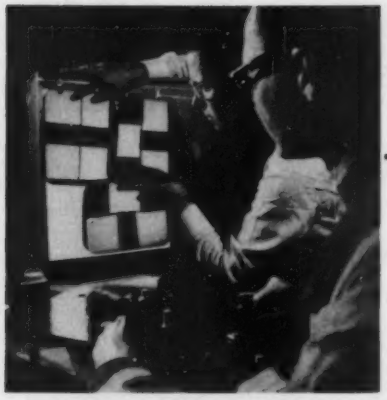

Ordinarily foundries try to prevent the formation of defects in their castings. American Brake Shoe Co. did the opposite—it produced defective steel castings as a step in the preparation of a series of radiographic standards for the Naval Ordnance Laboratory. See Page 167.

The Positive Approach 57
Editorial—By FRANK G. STEINEBACH

Automated Shell Mold Line for Port Valves . . 58
Exhaust port valves are produced in four-part, resin-bonded sand molds backed up with shot in flasks. Automatic core and mold machines are featured in their production—By ROBERT H. HERRMANN

Chrysler Diecast Block Reduces Engine Weight 62
Chrysler Corp.'s diecast aluminum engine block for the Lancer weighs only 64 lb. Gray iron head, cylinder sleeves, and main bearing caps are used—By E. G. MOELLER, W. L. WEERTMAN, and H. E. ERIKSEN

How To Save Brass Foundry Metal 65
Reduction of metal losses offers foundries an opportunity to cut operating costs without a heavy investment. This article describes several areas in which metal losses should be checked—By HARRY ST. JOHN

Gating and Risering Investment Castings 68
In this article, 19th in our gating and risering series, the author covers nomenclature, pattern setups, and flask molding of investment castings and shows how ferrous and nonferrous practices differ—By HYMAN ROSENTHAL

An Improved Method for Foundry Estimating . 73
Scientific methods being taught to engineers can be used in foundries. This article discusses an application of statistics to estimating molding and coremaking times—By GARY G. STONE and E. PAUL DeGARMO

Sand Handling by Air Conveyors 76
Pneumatic systems move sand efficiently over long distances, before or after mulling. Their advantages include flexibility and space saving. Here's how they work—By H. W. ZIMNAWODA

New Technique of Gating 81
Some metallurgists say that it can't be done, but 2½-in. test cubes of stainless steel have been cast off a hollow sprue of ⅜-in. mean wall thickness. The test work is described here—By LEO E. CARR

The World of Cast Metals 23
AFS Congress Offers Many Attractions 23
Gray Iron Specifications Tighter 23
FEF Conference To Be April 19-20 26
Society of Die Casting Engineers Grows 26
Aluminum Anniversary Observed 29

Molding Sand Additives 102
This closing article in our series on molding sand is a general treatment of additives such as wood flour, seacoal, and silica flour. They are classified and their effects are explained—By W. P. WINTER

CONTINUED NEXT PAGE

Editor: WILLIAM G. GUDE

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CONTINUED FROM PAGE 3

Malleable T & O Conference 112
By W. G. GUDE, EDWIN BREMER, R. H. HERRMANN, and J. C. MISKE

Incentive Plan Cuts Casting Repair Cost 121
To cut casting repair cost, combine better repair methods with a work measurement and incentive plan—By ROBERT C. BATCHELOR

Man to Man 126
There are three kinds of people—thinkeruppers, getterdoners, and doers—and each is important—By RALPH L. LEE

Southeast Regional Foundry Conference 131
By WILLIAM G. GUDE

Wisconsin Regional Foundry Conference 141
By EDWIN BREMER and ERLE F. ROSS

Foundrymen Discuss Marketing Applications . . 156
Milwaukee conference on profitable application of marketing to the foundry industry is attended by 125 representatives of 46 foundries

Mobile Foundry Unit Completes 12-State Tour . 160
Sand conditioning demonstration plant travels more than 20,000 miles to visit 78 foundries in 12 states and is ready for more touring

Radiographs To Set Navy Casting Standards . 167
Radiographic standards for steel castings with sections from 0.13 to 0.75 in. are being prepared for the Bureau of Naval Weapons

See Bigger Market for Investment Castings . . 170
Haynes Stellite Co., Kokomo, Ind., anticipates broader markets for investment castings as result of four new company production developments

In Every Issue

Around the Country	150	**Literature for Foundrymen** .	135
Calendar of Meetings	32	**Men of Industry**	175
Equipment and Supplies . .	89	**Obituary**	182
Foundry Developments . . .	118	**Patents of Interest**	162
How To Do It	110	**Questions and Answers** . . .	84
Industry Briefs	109	**Readers' Comment**	55
Late News	17	**Statistics**	17

With the Editors 10

Classified Advertising—190 Advertisers' Index—199 Business Staff—199

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FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

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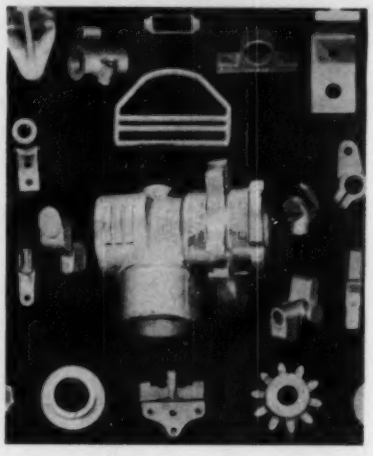
THE EDITORS' WORKSHOP

TECHNOLOGY: Eight years ago, FOUNDRY presented a comprehensive review of postwar developments in foundry technology. Next month's issue will include a similar report detailing what technical progress has been made in the intervening years



to strengthen the position of castings.

Prepared by authorities in their respective fields, this package of seven individual articles will provide a unique reference source on the current status of metal castings and foundry practices. The subject will be discussed under the headings of gray iron, steel, malleable iron, aluminum, brass and bronze, magnesium, and zinc.

HISTORY: The history of the foundry industry in California — dating back to 1849—is as colorful as that of the state itself. Harold Henderson has prepared an interesting story about the foundrymen who developed the West Coast castings industry during the last 112 years. Watch for it next month, along with details of the 65th Castings Congress of the American Foundrymen's Society.

PINHOLING: This defect, which has plagued iron foundrymen for many years, is the subject of a coming article discussing the mechanism by which it forms. It also suggests investigations which could lead to elimination of the trouble.

Circle 558 on Page 39→

Blunt way to ask for an order? Perhaps, but we believe in the direct approach. In fact, that's the way we deal with all of our customers. *We sell direct*—strictly a furnace-to-foundry operation. But buying direct is just one of the advantages you have when you get your pig iron from our furnaces at Cleveland, Ohio. Another, and equally important advantage is that you will be dealing with an organization whose plant is designed for and devoted exclusively to the production of *merchant* pig iron. As a customer, you have access to an almost unlimited storehouse of United States Steel's metallurgical and technical knowledge. *If you have any problems pertaining to foundry operation, our Foundry Service Metallurgist can undoubtedly help you solve them.* Incidentally, American Steel & Wire does not allocate a single pound of its merchant pig iron output to any United States Steel mill. *All of it is for sale!* American Merchant Pig Iron is produced in one of the industry's largest and most modern plants. It is carefully made from selected raw materials under highest standards of quality control. It features a minimum of "tramp element" contamination; has uniform, well distributed graphite content, and a full percentage of desired elements. You can get American Merchant Pig Iron in 35-lb. pigs . . . in any wanted grade: Basic, Foundry, Malleable, Bessemer, Intermediate and Low Phosphorous, including Low Manganese for Ductile Iron Casting.

To sum up—We have the facilities and the capacity to take care regularly of your immediate and future pig iron requirements. The quality of American Pig Iron is consistently and uniformly high to enable you to produce *consistently* better products.

Weigh what we offer you against what you have been getting. If you want more information, just say so. We will be glad to answer your questions—by mail, phone or in person. And without obligating you in the least. Pig Iron Sales Department, American Steel & Wire, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

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USS **American Steel & Wire**
Division of
United States Steel

STRIP PRECISION CORES IN SECONDS!

FIELD TESTED... PROVEN

PRODUCTION FOUNDRIES... get PRECISION CORES at HIGH SPEED and LOW COST

Another ADM FURAN INNOVATION...

CHEM-REZ "100"*

the foundry industry's MOST VERSATILE resin

Not since the introduction of ADM's CHEM-REZ "A-200" has a resin caused such excitement among foundrymen.

The speed, accuracy, quality and economy now possible with CHEM-REZ "100" is hard to believe without seeing it perform in your own shop. Start reaping the extra profits today . . . call your ADM—MAN to arrange a demonstration.

CHEM-REZ "100" FITS YOUR CURING SYSTEM

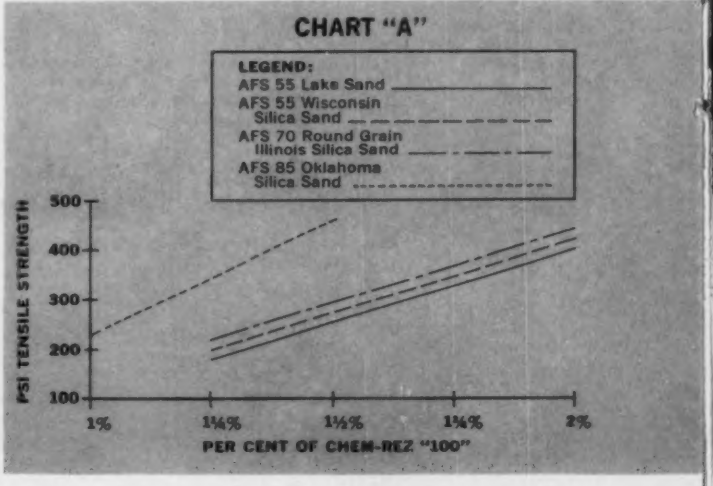
Although developed for hot box application, this resin is exceptionally versatile . . . can be used in dielectric and oven baking systems. Mixtures, of course, vary slightly depending upon the curing system. For instance, in dielectric and conventional systems, it is desirable to add small amounts of Archer Cereal, Green Bond Western Bentonite, and water to the basic mix used for hot box application.

CHEM-REZ "100" NEEDS NO SPECIAL MIXING EQUIPMENT

Mixing of this resin and catalyst into sand is not difficult since the resin is a liquid and all sand grains quickly and easily coated. Thus, mixing takes only a few minutes and existing mullers or mixers can be used.

CHEM-REZ "100" PERMITS USE OF MOST SANDS

Sand grain sizes and structures are not particularly critical. Silica sands not exceeding .3% clay content and within the grain size range of AFS 50 to AFS 100 are preferred. Fairly fine sands can be used for the hot box process without inducing gas problems as indicated on Chart B. Chart A shows tensile strengths attained with several different types of sands.



*In Canada, manufactured and sold under the trade-name, ADMIREZ "100".

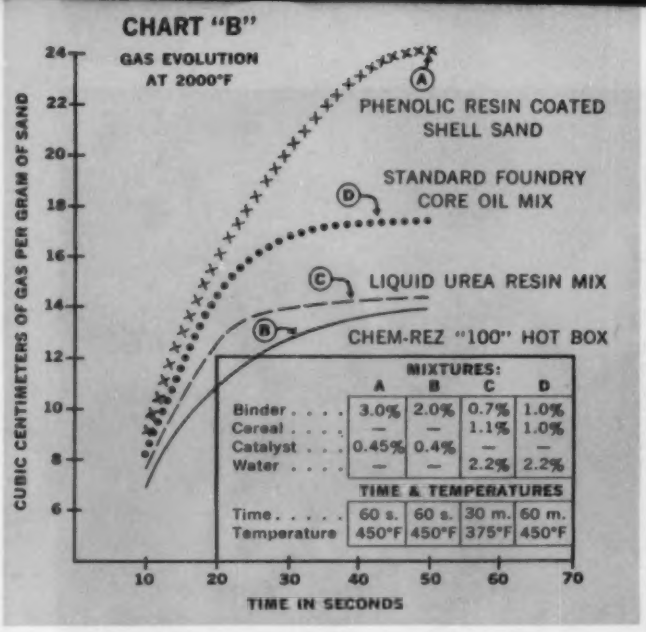


CHART "B"
GAS EVOLUTION AT 2000°F
CUBIC CENTIMETERS OF GAS PER GRAM OF SAND
TIME IN SECONDS
PHENOLIC RESIN COATED SHELL SAND
STANDARD FOUNDRY CORE OIL MIX
LIQUID UREA RESIN MIX
CHEM-REZ "100" HOT BOX
MIXTURES:
A B C D
Binder 3.0% 2.0% 0.7% 1.0%
Cereal . . . . — — 1.1% 1.0%
Catalyst . . . 0.45% 0.4% — —
Water . . . . — — 2.2% 2.2%
TIME & TEMPERATURES
Time . . . . . 60 s. 60 s. 30 m. 60 m.
Temperature 450°F 450°F 375°F 450°F

CHEM-REZ "100" DOES NOT DEMAND RADICAL SYSTEM CHANGES

With this versatile resin, foundrymen do not have to learn a tedious new technology. Mulling, blowing and stripping are not critical and do not involve highly specialized techniques. Any foundry geared to handle wet type core mixtures will have no difficulty adapting to CHEM-REZ "100". In using the hot box system, however, blowers have to be modified to handle heated core boxes.

CHEM-REZ "100" OFFERS SUPER-SPEED PRODUCTION

Blowing the resin bonded mixture into core boxes preheated to 400° to 500°F. permits stripping within 15 to 45 seconds . . . as soon as a shell is formed on the core. At this point the core can be handled while the curing continues through chemical reaction triggered by heat. CHEM-REZ "100" cores collapse completely and shake out fast.

CHEM-REZ "100" REDUCES MATERIAL AND PRODUCTION COSTS

Besides the dollar saving from shorter sand preparation and curing cycles, CHEM-REZ "100" reduces the cost of the mixture considerably. Cost of the resin, itself, is about 30% less than a phenolic resin for shell core production. Furthermore, less resin is used and no release agent is needed for hot box application. High strength of the cores reduces core scrap. Chart C reveals basic time-cost comparisons between typical CHEM-REZ "100" Hot Box Cores and Phenolic Shell Cores.

CHART "C"

TIME-COST COMPARISON PROVES PROFIT POTENTIAL OF CHEM-REZ "100"

PROCESS	COST OF RESIN	COST OF TYPICAL MIXTURE	CURE CYCLE	SAND PREPARATION TIME
CHEM-REZ "100" HOT BOX PROCESS Typical Mix: Sand . . . . . 100 lbs. Resin . . . . . 2 lbs. Catalyst . . . . . 0.6 lbs. Release Agent . . . . . None	16.3¢** per lb. delivered	37.4¢ per 100 lbs. of sand	30 sec. at 400° to 450° F	½ to 3½ minutes
PHENOLIC RESIN SHELL PROCESS Typical Mix: Sand . . . . . 100 lbs. Resin . . . . . 3 lbs. Catalyst . . . . . 0.45 lb. Wax . . . . . 0.09 lb.	23¢ per lb. delivered	84.6¢ per 100 lbs. of sand	50 sec. at 500° to 550° F	6 to 15 minutes

CHEM-REZ "100" PRODUCES HIGH QUALITY CORES AND CASTINGS

Hot box cores made with this resin have an extra-hard, smooth, moisture resistant finish. They are dimensionally stable, non-thermoplastic, and will not warp or sag. During pouring, these cores are highly resistant to metal penetration, erosion and veining. Their high strength, low gas content and fast shake-out properties make them ideal in the production of intricate automotive type castings such as manifolds and water jackets.

**East and North of Kansas City. Price subject to change without notice.

CHEM-REZ "100" and CHEM-REZ "A-200"...
DEVELOPED, MANUFACTURED and DISTRIBUTED BY:

Archer-Daniels-Midland company

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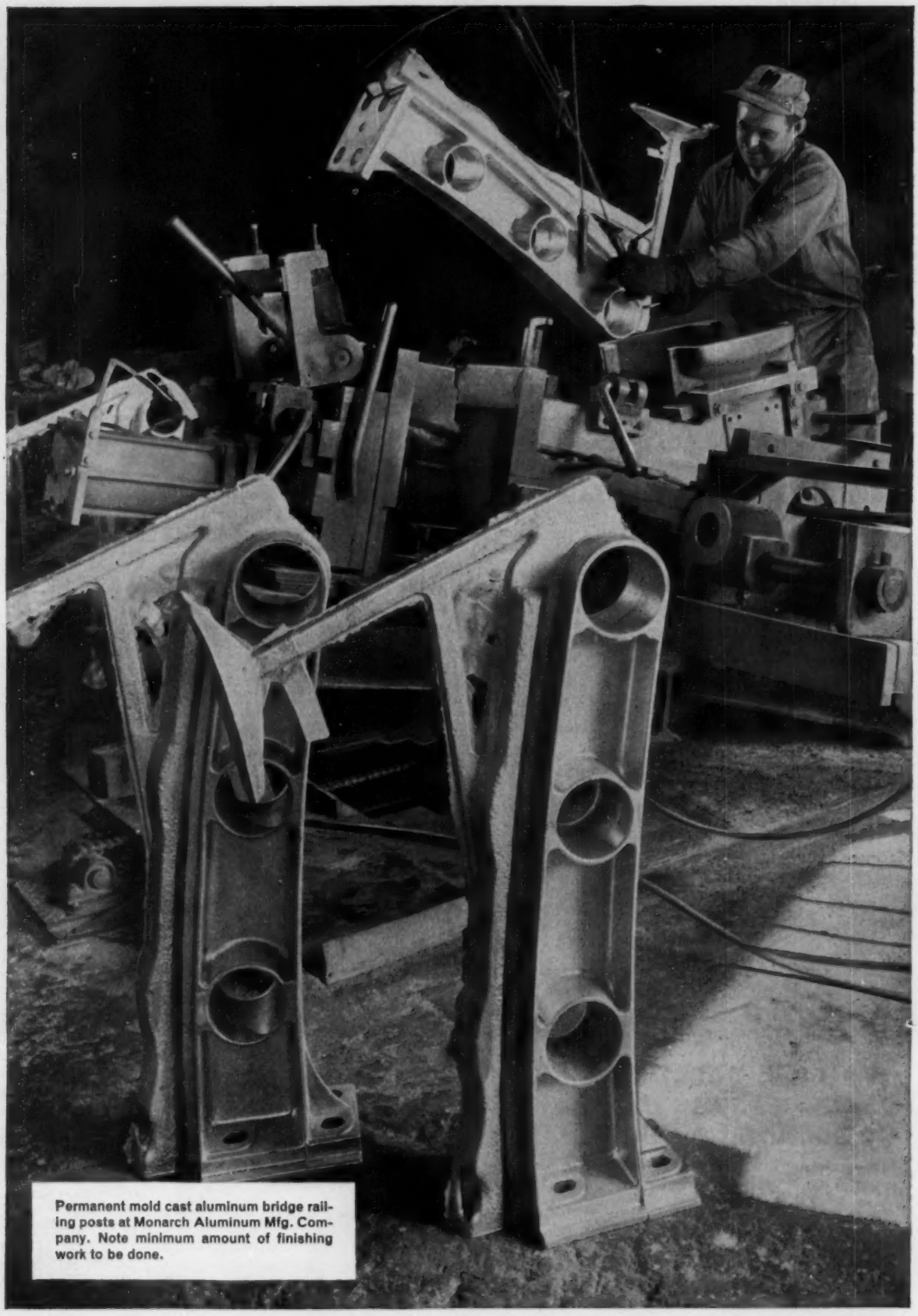
For More Information Circle 559, Page 39



Permanent mold cast aluminum bridge railing posts at Monarch Aluminum Mfg. Company. Note minimum amount of finishing work to be done.

product:
BRIDGE RAILING POSTS

production method:
PERMANENT MOLD CASTING

problem:
DUCTILITY

solution:
REYNOLDS ALUMINUM A-356 ALLOY

The Monarch Aluminum Mfg. Company, Cleveland, Ohio, produces over five million castings a year for a wide range of fine products. Here is why Reynolds A-356 alloy is used in one of these products, aluminum bridge railing posts.

"The new Reynolds Aluminum alloy A-356 is more ductile than its predecessor, 356, and therefore even better qualified for production of bridge railing posts," says Mr. R. A. Lawson, Vice-President of Marketing at the Monarch Aluminum Mfg. Company. This job is a natural for the permanent mold casting process where we must meet the rigid highway standards of strength, safety and appearance, and still hold manufacturing costs to a minimum. The availability of Reynolds A-356 with increased ductility opened the door for us to meet the high standards set by the U. S. Bureau of Roads.

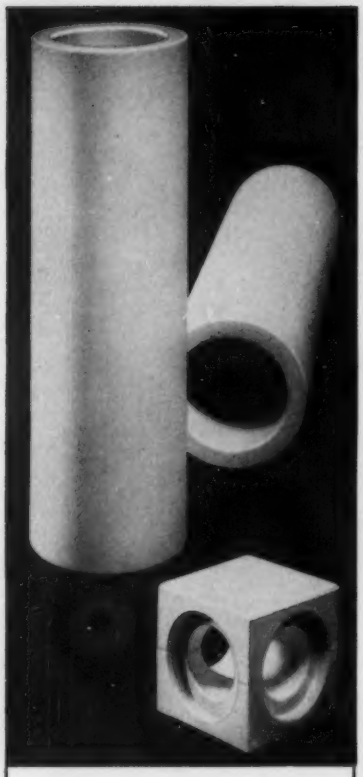
"We use many Reynolds Aluminum alloys in our plant, including 13, 43, 355, and B195," Mr. Lawson adds. "In addition to their fine service and the excellent quality of their ingot products, Reynolds has been very helpful to us by making available much valuable marketing and research information, as well as in developing new markets for cast aluminum products."

Reynolds produces many aluminum alloys ideally suited for permanent mold, sand mold and die casting. Excellent mechanical properties, weight savings, good conductivity, workability including machining and finishing savings make aluminum castings attractive for many products. For help in specifying the exact aluminum alloy for your production needs and product use, contact your Reynolds Ingot Distributor. *Or write Reynolds Metals Company, P.O. Box 2346-FK, Richmond 18, Virginia.*

REYNOLDS ALUMINUM

Watch Reynolds TV show "Harrigan & Son", Fridays; also "All Star Golf", Saturdays—ABC-TV

For More Information Circle 560, Page 39



Louthan gate tiles cut foundry costs

You minimize casting problems, get cleaner castings when you use Louthan refractory gate tiles (elbows and tees to match). They prevent erosion of the gates in steel castings, safely withstand high temperatures, will not react with the molten metal. All popular diameters and lengths can be furnished.

Write for Free Gating and Risering Refractory Folder. Complete file of specifications on all Louthan products.

LOUTHAN
MANUFACTURING COMPANY
A DIVISION OF FERRO CORPORATION
EAST LIVERPOOL, OHIO

For More Information Circle 561, Page 39

With the EDITORS

Gude to Germany: Editor Bill Gude has been asked by Volkswagen of America Inc., Englewood Cliffs, N. J., to join a group of American editors for a visit to Volkswagen plants in Wolfsburg and Hanover, Germany. Bill will leave by jet at midnight on April 18 and will return to New York April 25. He will be especially interested in reporting to you the methods used to produce the iron, aluminum, and magnesium castings used in this foreign car.

Many Vises: The accompanying illustration of Cy Seymour, chairman, Columbian Vise & Mfg. Co., Cleveland, and a former associate of mine in War Production Board days, was published in a recent issue of *Malleable Iron Facts*, a promotion publication of the Malleable Founders' Society. The article accompanying the illustration points out that in 1917, Mr. Seymour patented a vise made of malleable iron castings. That type of component was selected because of its strength, and the castings were

cored out to provide uniform thickness of section and high strength. The company has continued to produce that type of vise over the years, and today has nearly a million industrial vises in use, with every one still carrying an unconditional guarantee.

Incidentally, in Washington in 1941, Cy was associate chief, Mill Supplies Unit, Production Division, Aircraft, Ordnance and Tools Branch, Tools Division. Quite a handle, don't you think?

Just Viewing: Editor Bill Gude, Associate Editor Bob Herrmann, and I attended the press conference held recently by Central Foundry Div.,

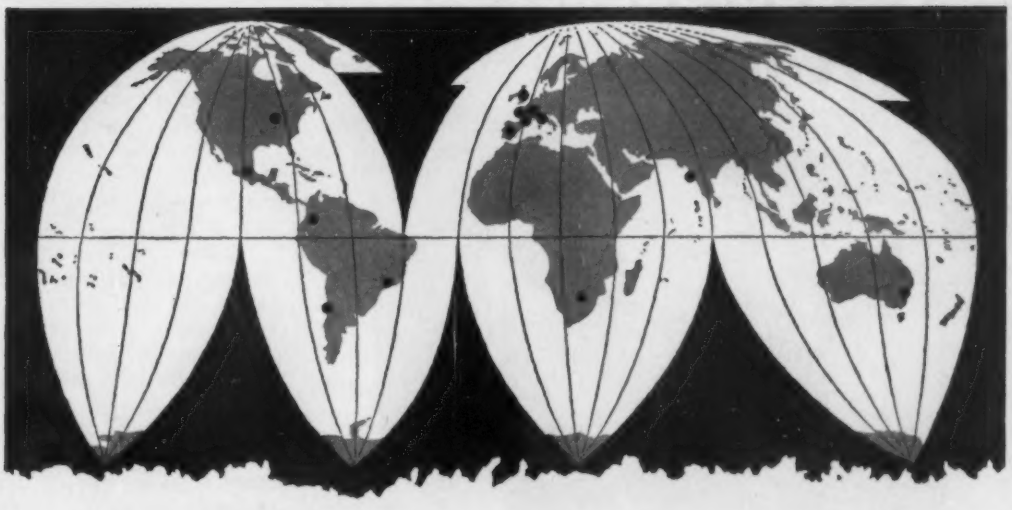
General Motors Corp., at the Defiance, Ohio, plant to see production of aluminum castings for their G M compacts. During the inspection of the plant, the photographer was busy. The accompanying photograph shows James H. Smith, general manager, Central Foundry Division (left) and me viewing an interesting shakeout of parts. I think both of us still get a thrill from seeing a well designed mechanical operation functioning smoothly.

Only 70 Years!: During the recent rugged winter, the press reported breaks in large water mains in several cities. Since newspapers usually look askance on an emergency of that type, it is interesting to find a press report that plays up the age and service of cast iron pipe.

The following story is from the Cleveland *Press*:

Water Main
That Broke
Laid in 1891

" 'The 36-inch water main that broke yesterday at Payne Ave. and E. 45th St. was laid in 1891,' Tom



in use and available everywhere

DIETERT *foundry sand testing and control equipment*

Consistent quality in foundry production begins with control tools that are practical in design, durably constructed and dependably accurate. That is why Dietert sand testing and control equipment is preferred and used by leading foundries everywhere.

Dietert supplies over 300 tools for control, including core testing instruments, automatic sand tempering, sand distributing and cycling systems, room and high-temperature testing equipment for all molding materials, and carbon and sulfur determinators.

Available through distributors in principal countries throughout the world.

BRITISH ISLES
Ridsdale & Co. Ltd.,
Newham Hall,
Middlesbrough, England

BELGIUM
Cie. Bruxelloise de Reequipement
192, Rue Victor Hugo
Brussels 4, Belgium

DENMARK
H. Struers chemiske Laboratorium
Offices in Copenhagen,
Arhus and Odense

SWITZERLAND
Baer Industrie Produkte AG
3, Dammweg
Berne, Switzerland

SOUTH AFRICA
Barry Colne & Company (PTY) Ltd.
157-159, Main Street
Johannesburg, South Africa

AUSTRALIA—NEW ZEALAND
Gibson Engineering (Sales) Pty. Ltd.
466 Wilson St., Redfern
Sydney, Australia

ITALY
S.p.A. Fenwick
Viale Vittorio Veneto 16
Milano, Italy

Bonvillain & Ronceray Italiana
27 Via Durini
Milano, Italy

INDIA
Pioneer Equipment Co., Private Ltd.
Offices:
Bombay, Calcutta and
Madras, India

Raj-Der-Kar & Company,
Commissariat Building
231, Hornby Road, Fort,
Bombay 1, India

FRANCE
Fenwick S. A.
8, Rue de Rocroy
Paris, 10e, France

Ph. Bonvillain & E. Ronceray
Rue Paul Carle
Choisy-le-Roi (Seine), France

SPAIN
Omnium Iberico Industrial
Calle Antonio Maura No. 18
Madrid, Spain

MEXICO
Cia. Proveedora de Industrias, S.A.
Marsella 78
Mexico 6, D.F.

Hoffman-Pinther & Bosworth, S.A.
Apartado 101-BIS
Mexico 1, D.F.

SOUTH AMERICA
Eisa Argentina
Yatay 792
Buenos Aires, Argentina

Milciades Sanchez
Ave. Jimenez No. 7-25
Bogota, Colombia

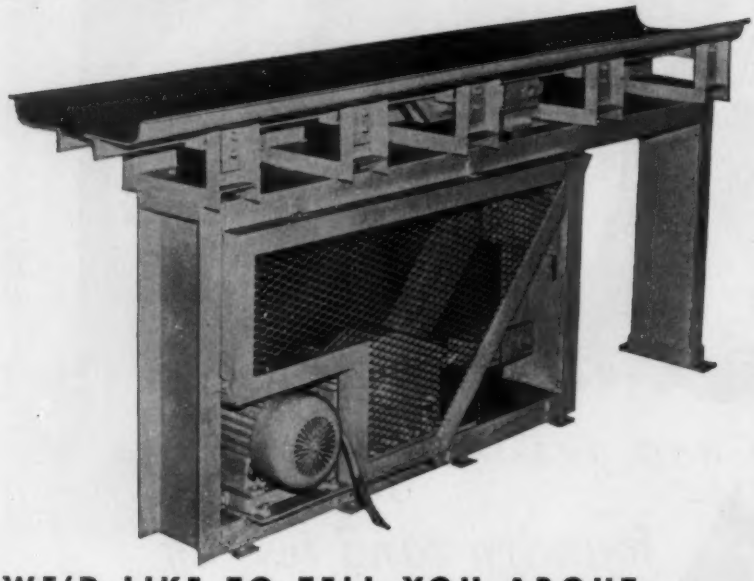
Equipamentos Industriais "Eisa" LTDA.
Rua Marconi 23, 8º andar
Caixa Postal 4584
Sao Paulo, Brazil

Tecnagent (ex-Manuel Sigren)
Calle Agustinas 1070, of. 224/5
Casilla 2697
Santiago de Chile

HARRY W. DIETERT CO.
9330 Roselawn
Detroit 4, Michigan

For More Information Circle 562, Page 39

IF YOU ARE
THINKING ABOUT
O-S-C-I-L-L-A-T-I-N-G
CONVEYERS



WE'D LIKE TO TELL YOU ABOUT
LIVE-FLO

AN AMAZING NEW SYSTEM
OF HANDLING MATERIALS

LIVE-FLO units are oscillating conveyers of extremely simple design. They will negotiate turns and moderate grades, are unbelievably quiet in operation, and convey small parts smoothly and under complete control.

LIVE-FLO can be applied anywhere in your plant where materials must be conveyed in a continuous flow at slow, evenly controlled speeds. It will provide an amazingly smooth, low-cost conveying system.

Write today for Bulletin #LF 60.

MATHEWS CONVEYER COMPANY
GENERAL OFFICES . . . . . ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIV. . . . MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

MATHEWS
(Member Foundry Equipment Manufacturers Association)

Stanton, water commissioner, said today.

" 'That's not old for a cast iron pipe,' he said. 'We have some a hundred years old. There's one on Euclid Ave., for instance.'

"The life of a cast iron pipe is not known. Philadelphia has some well over a hundred years old. In France some cast iron pipes are still in use after more than 300 years.

"He said that a rupture is hard to explain. Yesterday's break was not at a joint, but in a straight section of pipe.

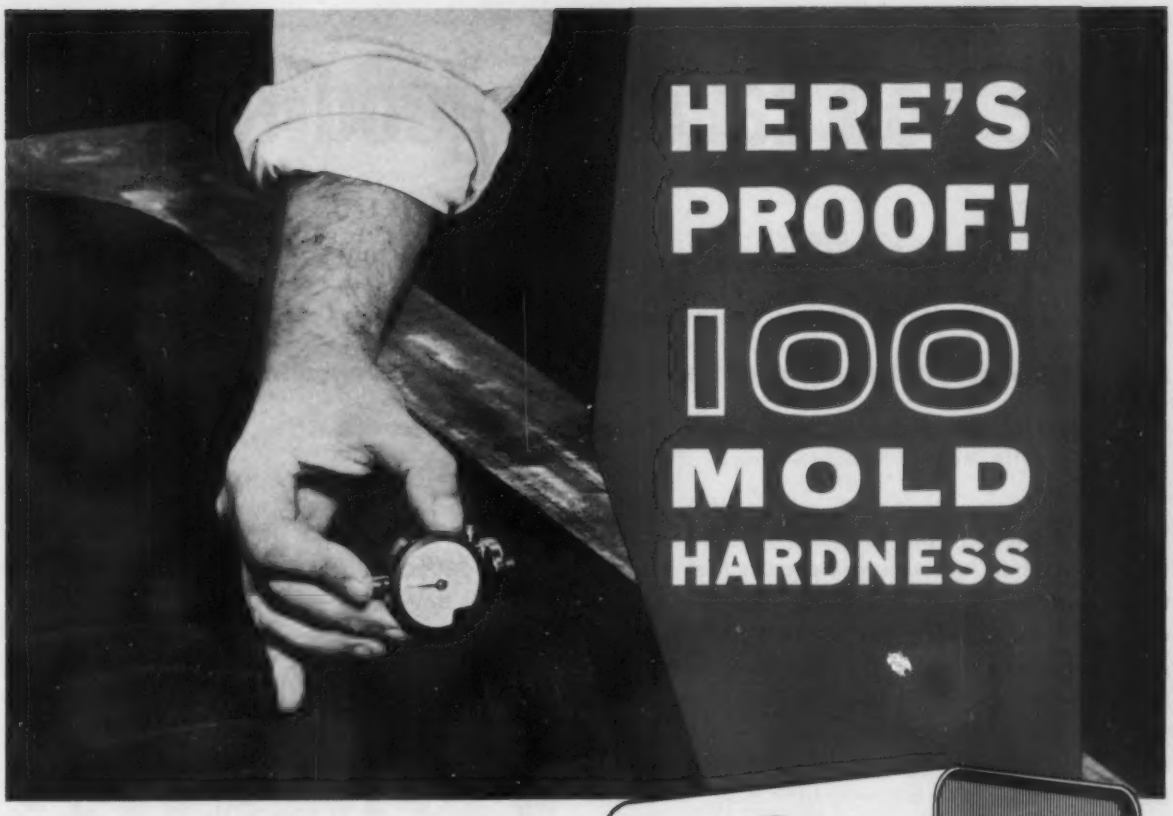
"Stanton said probably a combination of circumstances causes breaks like that—vibration by traffic, varying earth pressures, possibly some acid conditions of the earth might have something to do with it."

Maximum Readiness: That the Navy is aware of and appreciates the contributions of science and industry to progress in that branch of the military was emphasized recently by Admiral Arleigh A. Burke, chief of Naval Operations. In his talk accepting the Silver Quill Award of National Business Publications (a talk much publicized because of censorship action by the administration) the admiral included the following:

"Scientists and engineers have helped us simplify the design of our weapons. They have helped us to eliminate unnecessary gadgets, to reduce costs, without sacrificing combat effectiveness. Such contributions as these are particularly important, because weapons and weapons systems are getting more and more expensive and complex. Savings must be made in every way possible, and simplicity in design and operation is vital because our new weapons are not going to be operated by scientists but by the same Navy men who have served their country so well in the past.

"The technological progress that is being made today would not be possible without the active and enthusiastic support of manufacturers. The Navy will need that support to conduct research—to close the time-gap between ideas and actual hardware—to speed up our progress and our deliveries of weapons to the Fleet—to stay at maximum readiness."

F.G.S.



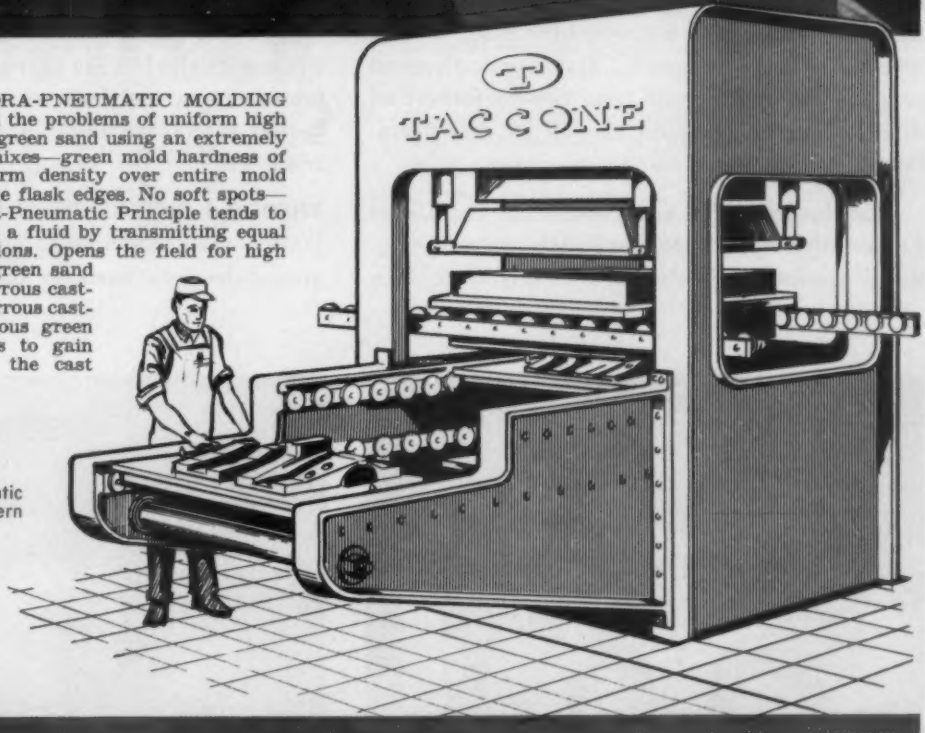
HERE'S PROOF!

100 MOLD HARDNESS

The TACCONE HYDRA-PNEUMATIC MOLDING MACHINE has solved the problems of uniform high density molding with green sand using an extremely wide range of sand mixes—green mold hardness of 100 if desired. Uniform density over entire mold surface right up to the flask edges. No soft spots—the TACCONE Hydra-Pneumatic Principle tends to make the sand act as a fluid by transmitting equal pressure in all directions. Opens the field for high production precision green sand molds for thin wall ferrous castings, as well as non-ferrous castings. Allows the ferrous green sand casting business to gain more prominence in the cast metal industry.

Demonstrations invited.

TACCONE Hydra-Pneumatic Mold Machine with Pattern Shuttle Equipment.



TACCONE CORPORATION
NORTH EAST • PA.

For More Information Circle 564, Page 39

Have you taken a good look at

There's a difference in loaders. You may have heard about the new Cat wheel loaders and thought, "Here's just another line of loaders—what can they do for me that my present equipment can't? What's the difference in them?" If that's what you think, take a good look. There's a big difference.

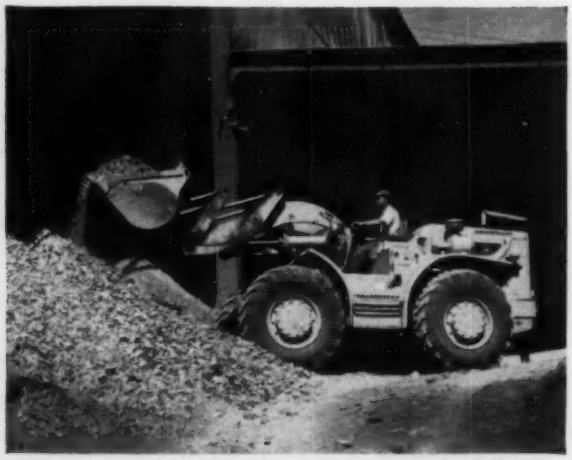
THERE'S A DIFFERENCE IN PERFORMANCE—only Caterpillar wheel loaders have automatic positioners that set the bucket or tine loading angle while the operator is maneuvering into position, and lift and stop the bucket automatically while the operator is driving to the bin or dump area. They speed up every cycle, do part of the operator's work for him automatically. Cat wheel loaders have fast power shift transmissions that give fast, smooth shifting forward, reverse, 1st and 2nd speeds. Travel or work speed range selector also shifts from two- to four-wheel drive. Controls are power boosted for easy operation, fast response.

Cat loaders offer you dependable Cat Diesel Engines that operate on low-cost furnace oil—optional gasoline engines on the two smaller models.

THERE'S A DIFFERENCE IN SAFETY—the operator never had it so good or so safe. He mounts a Cat loader up three wide steps, no climbing over tires or struggling up ladders. Fenders protect him. He's comfortable, confident and safe; and so are the men working around him. Because of the excellent visibility from a Cat loader, the operator can see where he's going and what he's doing through every part of the cycle. Safety men notice that the lift arms and hydraulic cylinders are all in front of the operator, not moving up and down on each side of him. And besides safety, the design provides extremely long reach and high lift.

THERE'S A DIFFERENCE IN SERVICE—Caterpillar Dealers are accustomed to providing service on an around-the-clock basis to their customers. Their

FORK LIFT in warehouse miscellaneous handling. This 922 can work in only 8 feet of aisle space.



2 YD. BUCKET is standard—note the 944's long reach. Material handled: shale-clay at the Virginia Lightweight Aggregate Corp.

the NEW CAT WHEEL LOADERS?

factory-trained service staffs know the importance of keeping equipment running. You can count on your Cat Dealer for expert service, any time, anywhere. Genuine Cat parts are always available. The Cat loader you buy today will have a parts stock behind it as long as you're using the machine.

Shouldn't you take a longer look?

We'll gladly send you more information and complete specifications on the new Caterpillar wheel loaders. Just send in the coupon or, better yet, look in the Yellow Pages and call your nearby Caterpillar Dealer. He knows heavy equipment and has some good answers for your material handling problems!

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

TRAXCAVATORS ARE MAKING OTHER LOADERS OBSOLETE

3 MODELS
to match any job!

966—2¾ cu. yd. standard bucket—140 flywheel HP
Dumping reach @ 7′ height: 57″
Maximum lift: 12′10″

944—2 cu. yd. standard bucket—105 flywheel HP
Dumping reach @ 7′ height: 51″
Maximum lift: 12′

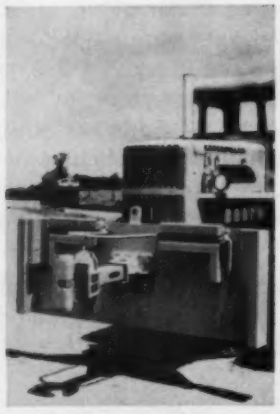
922—1¼ cu. yd. standard bucket—80 flywheel HP
Dumping reach @ 7′ height: 41″
Maximum lift: 11′2″

ATTACHMENTS
for bulk material handling

Whatever you'd like to move, load, unload, stockpile, stack or dig with a wheel loader, there's most likely a Traxcavator attachment to help you do the job. If there isn't, just tell your Caterpillar Dealer what you want from a machine—he has the facilities to help develop an attachment that meets your specific needs.

Current attachments include buckets to handle any weight or type of material, side dump buckets, bulldozers, forks, snowplows, snow blowers, pipelayers, backhoes and cabs.

SIDE DUMP BUCKET—another Caterpillar exclusive—permits the rig to dump to left, without turning, or forward.



FREIGHT CAR COUPLER and pusher is an example of a special attachment made by a Caterpillar Dealer.

CATERPILLAR TRACTOR CO.
Dept. L-236, General Offices, Peoria, Illinois, U. S. A.

Gentlemen: Please send me more information on Traxcavator wheel loaders for industrial bulk materials handling.

I am particularly interested in _____ (model number)

for handling _____ (names of materials regularly handled)

We presently use _____ (type of equipment) (model)

_____ (bucket size or capacity)

Name _____

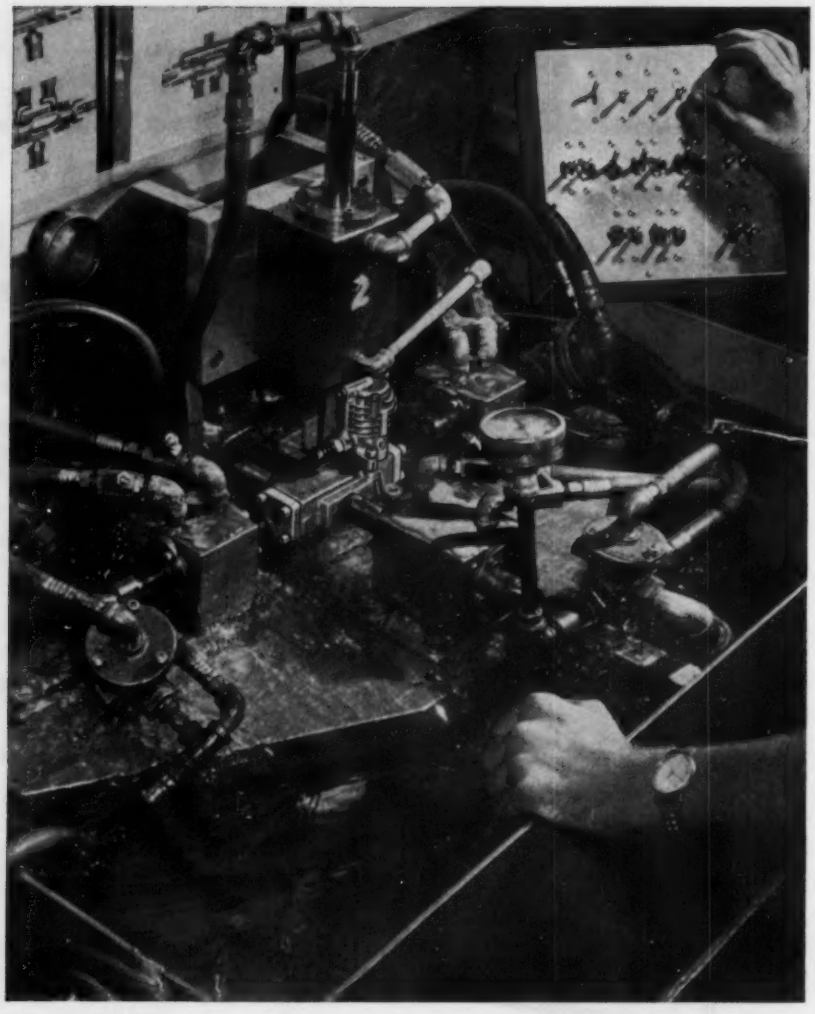
Title _____

Company _____

Address _____

City _____ Zone ____ State _____

Telephone _____ Extension _____



test every valve?

Valvair does! How else can any manufacturer be sure that every valve he ships to a customer will function properly, from the first cycle on?

Each Valvair valve is cycled and re-cycled under water, at 30 to 50% above its rated pressure, to be certain that it meets Valvair's rigorous performance specifications. And, this final operating test is just one of the countless rigid quality control inspections each part of every valve must pass during its manufacture. In fact, one out of every twelve Valvair production men is a full-time inspector. Parts are scrutinized in process, as well as just prior to assembly. The most modern types of equipment, including optical comparators, surface finish indicators, optical and air gaging units, super magnifiers and precision gages, are used by the inspection team to assure Valvair's reputation for outstanding quality.

Specify Valvair components for the equipment you design, build or operate, to maintain your reputation for quality. For all the facts, write for Bulletin 59-SK, or call your nearby Bellows-Valvair Field Office. Address Bellows-Valvair, Akron 9, Ohio, Dept. FO-461.

Bellows-Valvair

AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

8171

LATE NEWS

NODULAR AGREEMENT: Meehanite Metal Corp. and International Nickel Co. have concluded an agreement for the United States relating to the manufacture of magnesium-bearing spheroidal graphite cast iron. Meehanite has acquired the right to grant sublicenses to foundries in the Meehanite group for the production of the metal under patents owned by International Nickel. These castings will be manufactured under the technical direction of Meehanite and will carry the Meehanite trademarks.

FOUNDRY MODERNIZATION: Automotive Div., Budd Co., Detroit, is spending $3,380,000 on new foundry equipment, including a highly mechanized line for casting brake drums, a 9-ton induction holding furnace, a large shotblast cleaning unit, and a spectroscope for continuous checking of iron chemistry. When the modernization is completed, the foundry will be able to produce 34,000 passenger car drums and 4500 truck and trailer drums a day. Budd Co. also announced that divisional headquarters of Budd Automotive, previously in Philadelphia, have been moved to Detroit.

JAMES H. SMITH RETIRES: James H. Smith, general manager, Central Foundry Div., General Motors Corp., retired March 31 under provisions of the GM retirement program, closing a 46-year career with the corporation. Mr. Smith is a past president of the Malleable Founders Society and the Foundry Educational Foundation. He has been awarded the Charles H. McCrea Medal of MFS and the Peter L.

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons[a])

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1958	50,242,746	7,725,970	821,388	7,152,726
1959				
Nov.	4,796,896	614,233	82,784	891,555
11 mo.	51,958,011	8,730,019	1,046,520	8,223,879
Dec.	7,021,870	843,040	99,577	1,006,158
Total	58,979,881	9,613,059	1,156,097	9,232,037
1960				
Jan.	7,043,488	823,442	95,442	1,058,159
Feb.	6,493,558	822,476	97,688	1,015,716
Mar.	6,655,569	839,016	106,749	974,535
Apr.	5,625,717	754,486	82,767	787,186
May	5,051,121	771,800	79,170	652,585
June	4,485,444	809,297	87,485	633,797
July	3,678,127	603,062	55,974	520,361
Aug.	4,217,562	692,470	78,788	697,243
Sept.	4,148,550	732,252	76,939	641,712
Oct.	4,375,871	742,039	71,862	675,356
Nov.	3,939,970	709,187	70,282	607,471
11 mo.	55,714,977	8,299,527	923,146	8,564,121

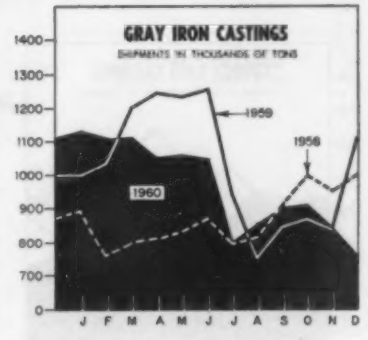
Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1960	1961
Jan.	95.5	123.7
Feb.	128.6	....
Mar.	159.9	....
Apr.	97.9	....
May	159.0	....
June	164.8	....
July	80.0	....
Aug.	92.4	....
Sept.	158.1	....
Oct.	81.7	....
Nov.	106.5	....
Dec.	101.2	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[a])

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[b]	Soil Pipe & Fittings Total[b]	Unfilled Orders[c]
1958	10,357,504	5,849,426	6,146,186	2,648,005	117,558	1,834,396	265,114	1,277,685	784,123	.....
1959										
Dec.	1,107,532	584,305	649,936	271,010	15,344	294,129	29,595	92,130	50,753	946,725
Totals	12,307,798	6,994,200	7,451,925	3,247,389	171,902	2,142,496	309,945	1,440,883	882,547	.....
1960										
Jan.	1,135,575	591,804	677,392	277,100	16,774	295,994	18,463	86,798	56,926	851,334
Feb.	1,107,721	571,143	678,927	279,190	16,430	284,738	17,848	76,332	49,876	855,324
Mar.	1,143,395	600,162	685,102	284,207	15,670	294,322	24,409	83,121	56,441	880,132
Apr.	1,051,357	580,590	609,234	258,994	13,980	232,895	21,737	118,886	68,606	824,495
May	1,052,798	588,770	613,745	257,180	13,126	207,094	20,414	136,455	75,090	781,594
June	1,049,638	601,597	622,236	273,148	15,010	183,049	19,810	144,773	79,770	719,564
July	803,306	450,589	478,269	202,347	10,694	120,784	16,226	120,652	67,375	754,789
Aug.	858,503	540,395	490,059	238,561	15,675	131,428	14,221	139,275	83,520	712,784
Sept.	909,497	527,227	554,788	245,887	14,616	125,658	13,460	135,327	71,234	695,325
Oct.	905,139	560,664	568,869	238,249	12,559	139,977	12,559	117,009	66,725	646,852
Nov.	835,709	454,611	538,817	230,022	11,870	123,064	12,310	182,959	58,469	568,974
Dec.	748,821	394,981	506,936	219,482	12,097	107,559	12,306	74,093	48,018	552,813
Totals	11,592,459	6,401,914	7,024,374	3,004,367	168,801	2,246,482	203,763	1,335,589	782,041	.....

[a]Source: U. S. Dept. of Interior Bureau of Mines. [b]Source: Bureau of the Census. [c]For sale only. [d]All cast iron pipe is shipped for sale. [e]Gray iron total included nodular iron.

Late News

Simpson Gold Medal of the American Foundrymen's Society.

DIECASTING CLINIC: Cleveland Chapter, Society of Die Casting Engineers, is sponsoring a diecasting application clinic April 19, from noon until 9 p.m., at the Pick-Carter Hotel, Cleveland. Area diecasters will be on hand to show samples of their castings and to answer questions concerning diecastings and their use.

Farther in the future, the second National Die Casting Exposition & Congress will be held in Cobo Hall, Detroit, Sept. 25-28, 1962, according to its sponsors, the Society of Die Casting Engineers. It will occupy 40,000 sq ft of floor space and is expected to attract 150 exhibitors and about 7500 visitors.

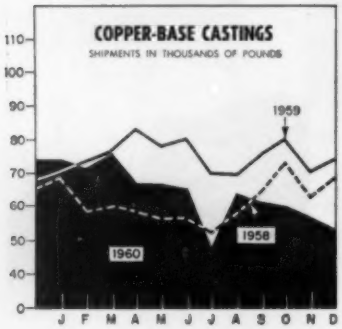
FOUNDRY FIRES: The 20,000-sq-ft brass and bronze foundry of California Brass Mfg. Co., Los Angeles, was almost totally destroyed recently by a fire of unknown origin. Machine shop and assembly areas were not damaged. The foundry will be rebuilt.

White Machine Works Inc., Eau Claire, Wis., suffered a $2 million fire on March 11, but the firm's gray iron foundry was not affected. Damage was confined to the finished goods shipping department.

NAME CHANGES: Foundry Services Inc., Cleveland producer of compounds to treat molten metals, molds, and dies, has changed its name to Foseco Inc. . . . Eastern Malleable Iron Co., Naugatuck, Conn., has changed its name to the Eastern Co. . . . Jelrus Precision Casting Co., New York, has changed its name to Casting Engineers, thereby assuming the same corporate identity as its Chicago parent company, which purchased Jelrus recently.

PERSONALS: Vincent D. Bates has been named factory manager, Oberdorfer Foundries Inc., Syracuse, N. Y. He was assistant to the president . . . David Matter has been appointed assistant vice president, sales and service, and Spencer S. Phillips has become manager, iron foundry service, Ohio Ferro-Alloys Corp., Canton, Ohio . . . Robert L. Williams has been elected vice president, Marketing

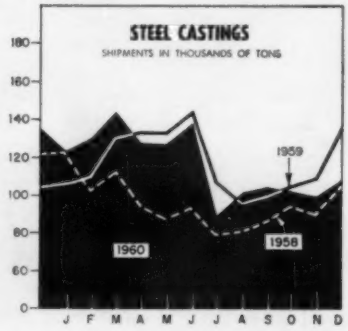
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1958	762,484	697,380	31,854	.....
1959				
Dec.	71,110	62,182	4,286	29,243
Total	871,032	765,246	52,456	.....
1960				
Jan.	73,971	65,742	3,915	26,053
Feb.	71,797	63,103	4,146	26,970
Mar.	75,908	66,517	4,346	27,470
Apr.	66,777	58,453	4,523	27,423
May	66,299	57,848	4,463	24,582
June	64,585	56,441	3,715	21,781
July	48,399	42,778	2,910	22,367
Aug.	63,765	56,344	3,669	21,915
Sept.	61,362	54,104	3,699	21,063
Oct.	59,877	52,734	3,556	22,008
Nov.	56,358	50,043	3,132	21,261
Dec.	52,996	46,224	3,369	21,918
Total	761,094	670,330	45,543	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

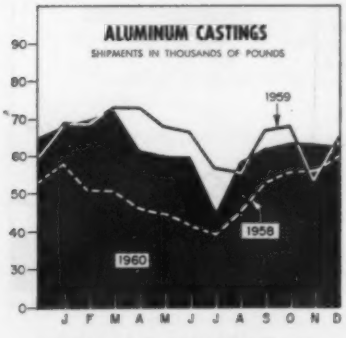
	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1958	1,121,000	856,986	149,644	801,846	606,240	136,251	319,154	250,746	13,393	.....
1959										
Dec.	133,346	104,138	18,868	99,643	77,517	17,200	33,702	26,621	1,668	306,346
Total	1,412,885	1,112,668	210,984	1,043,538	814,219	194,201	369,347	297,608	16,783	.....
1960										
Jan.	122,565	94,052	22,016	93,197	70,815	20,891	29,368	23,237	1,125	314,237
Feb.	129,259	97,927	26,532	96,888	72,963	25,328	32,371	24,964	1,204	279,684
Mar.	143,708	109,688	27,801	104,742	78,755	26,365	38,966	30,933	1,436	277,982
Apr.	127,219	96,557	26,101	93,433	70,251	24,526	33,786	26,306	1,575	248,902
May	126,580	97,231	26,793	93,700	71,808	25,324	32,880	25,423	1,469	252,298
June	136,992	107,076	29,185	101,294	78,601	27,503	35,698	28,475	1,682	233,765
July	89,565	67,294	16,196	63,753	47,570	15,570	25,812	19,724	624	223,880
Aug.	101,709	77,146	16,113	73,338	55,099	15,207	28,371	22,047	906	213,611
Sept.	104,298	79,556	16,843	74,447	56,126	15,945	29,851	23,430	898	199,413
Oct.	102,664	79,622	14,586	72,544	57,879	13,544	30,120	21,743	1,042	186,311
Nov.	99,577	78,305	15,768	69,927	55,466	14,113	29,650	21,839	1,655	174,317
Dec.	108,249	87,456	24,849	78,805	64,997	22,295	29,444	22,420	2,554	162,882
Total	1,497,049	1,151,532	262,783	1,016,068	781,530	253,760	369,293	270,675	16,172	.....

[1]Source: Bureau of the Census. [2]For sale only.

Div., Lester B. Knight & Associates Inc., consulting engineers, Chicago, New York, and Detroit . . . Donald Sanberg has resigned his position as administrative secretary, Malleable Founders Society, to become executive secretary, American Society of Lubricating Engineers, Chicago . . . Anton Dorfmueller Jr. has been appointed division manager, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland . . . J. J. Forst has been named assistant product manager, aluminum pig, ingot, and billet product department, Metals Div., Olin Mathieson, New York . . . Ralph W. Fink has been elected a vice president, Spincraft Inc., Milwaukee.

OBITUARY: John B. Frielingsdorf, 64, president, Banner Iron Works, St. Louis, died March 13 while vacationing in Nassau, the Bahamas . . . A. Y. Gregory, 70, former president, Whitehead Bros. Co., New York, died March 6 . . . Basil N. Greenlaw, vice president in charge of operations, Lancaster, Pa., and Zanesville, Ohio, plants, Burnham Corp., Irvington, N. J., died from injuries received in an explosion at the Zanesville plant on March 3 . . . Everett C. Meyers, plant superintendent, Ford Meter Box Co., Wabash, Ind., died March 22 . . . Paul V. Robinson, 65, secretary-treasurer, Robinson Clay Products Co., Akron, died March 13 after a long illness . . . Ervin W. Maas, 62, president and general manager, Kwik-Mix Co., a division of Koehring Co., Milwaukee, died March 17.

MISCELLANY: Adams Co., Dubuque, Iowa, has purchased all pattern, jigs, and similar equipment of Diamond Flask Co., Richmond, Ind., and will manufacture Diamond's line of flasks . . . M. Hertensteine Foundry Co., Columbus, has ended operations . . . North American Refractories Co., Cleveland, has purchased Ironton Fire Brick Co., Ironton, Ohio . . . Kramer Brothers Foundry Co., Dayton, Ohio, has purchased controlling stock interest in Dayton Automatic Stoker Co., Dayton . . . Regent Oil & Chemical Corp. has been organized at 14237 Detroit Ave., Cleveland. Robert D. Black, formerly sales manager, Rex Oil & Chemical Co., is president . . . Latrobe Steel Co., Latrobe, Pa., has purchased a majority interest in Cast Masters Inc., Racine, Wis.



PRODUCTION WORKERS

Estimated Number

	Dec. 1960	Nov. 1960	Avg. 1960
Ferrous	178,200	180,600	188,400
Nonferrous	47,200	47,900	50,500

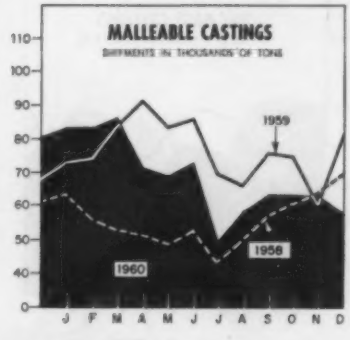
Average Weekly Earnings

Gray Iron	92.26	92.13	96.89
Malleable Iron	90.39	91.88	93.21
Steel	100.70	100.99	101.53
Nonferrous	101.38	101.09	101.30

Average Weekly Hours

Gray Iron	37.2	37.3	38.7
Malleable Iron	36.3	36.9	38.2
Steel	38.0	38.4	38.9
Nonferrous	39.6	39.8	40.2

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[a])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[b]
1958	641,700	125,487	224,092	290,275	.....
1959					
Dec.	65,206	12,368	20,356	32,379	86,947
Total	786,399	141,987	274,855	368,101	.....
1960					
Jan.	68,247	11,278	22,368	34,514	92,109
Feb.	71,699	11,800	23,614	36,177	83,914
Mar.	72,216	12,934	22,413	36,749	78,024
Apr.	61,797	12,369	19,950	29,400	75,243
May	60,330	10,682	21,507	28,055	75,977
June	60,068	11,280	20,953	27,722	74,699
July	45,694	8,765	15,804	20,973	76,434
Aug.	58,848	10,639	18,901	29,256	75,230
Sept.	62,116	10,514	22,031	29,527	75,144
Oct.	63,750	10,149	23,339	30,213	71,364
Nov.	63,408	9,901	23,612	29,831	73,032
Dec.	62,240	9,576	23,272	29,380	71,396
Total	750,411	129,867	267,764	361,797	.....

[a]Source: Bureau of the Census. [b]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[a])

	Shipments Total	Shipments For Sale	Standard Total	Standard For Sale	Pearlitic Total	Pearlitic For Sale	Unfilled Orders[b]
1958	660,650	383,539	540,600	313,597	120,050	70,242	.....
1959							
Dec.	80,060	45,917	61,455	35,891	18,605	10,026	93,574
Total	916,362	557,303	729,568	449,946	186,494	107,357	.....
1960							
Jan.	83,188	46,154	63,637	35,933	19,551	10,221	100,302
Feb.	83,118	46,850	64,131	37,391	18,987	9,459	98,272
Mar.	96,243	49,907	67,448	40,422	18,795	9,485	84,679
Apr.	71,271	39,059	56,136	32,066	15,135	6,993	79,287
May	68,942	37,618	53,108	30,126	15,834	7,492	73,240
June	72,593	43,105	55,956	34,526	16,637	8,579	63,920
July	49,860	28,575	37,787	22,477	12,073	6,098	74,329
Aug.	58,785	36,765	46,522	29,077	12,263	7,688	69,853
Sept.	63,048	36,114	48,635	28,523	14,413	7,491	69,003
Oct.	63,521	35,492	47,932	27,813	15,589	7,679	56,616
Nov.	62,978	35,432	47,571	27,611	15,407	7,821	55,627
Dec.	57,154	31,500	43,319	24,729	13,835	6,771	54,657
Total	820,701	466,571	621,582	370,794	189,319	95,777	.....

Prices of Foundry Metals and Coke

(As of March 27, 1961)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-$18.50

OVENS

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearney, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, deld	77.79	78.29
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 28.25; tin bronze, No. 225, 38.00; No. 245, 32.50; high-leaded tin bronze, No. 305, 32.75; No. 1 yellow, No. 405, 24.75; manganese bronze, No. 421, 28.00.

ALUMINUM: Primary alloy No. 13, 25.90; No. 43, 26.20; No. 195, 27.60; No. 214, 31.50; No. 356, 26.80. Secondary No. 12 alloy, 22.75. Deoxidizing grades: No. 1, 23.75; No. 4, 21.00.

MAGNESIUM ALLOY: AZ91A, 40.75; AZ63A, AZ92A, AZ91C, 40.75, f.o.b. Velasco, Tex.

COPPER: Electrolytic 29.00, delivered Connecticut valley.

ZINC: High grade, 12.85, delivered. Die casting alloy No. 3, 14.25; No. 2, 14.75, delivered.

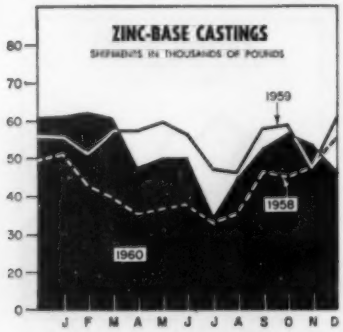
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Machinery Cast	Structurals, Plates	Malleable	Short Steel Rails
Birmingham	$32.00-33.00	$45.00-46.00	.....	.....	$37.00-38.00	.....	$34.00-36.00
Boston*	**23.00-24.00	**39.00-40.00	.....	**40.00-42.00	.....	.....	.....
Buffalo	29.00-30.00	**38.00-39.00	.....	**45.00-46.00	39.00-40.00	.....	48.00-49.00
Chicago	39.00-40.00	44.00-45.00	.....	49.00-50.00	42.00-43.00	47.00-48.00	53.00-55.00
Cincinnati*	**30.00-31.00	**36.00-37.00	**28.00-29.00	**46.00-47.00	.....	.....	**46.00-47.00
Cleveland	33.00-34.00	39.00-40.00	28.00-29.00	46.00-47.00	40.00-41.00	45.00-46.00	52.00-53.00
Detroit*	**28.00-29.00	**32.00-33.00	**25.00-26.00	.....	.....	.....	.....
Los Angeles	40.00	46.00	.....	.....	43.00	.....	.....
New York*	29.00-30.00	34.00-35.00	29.00-30.00	.....	32.00-33.00	.....	.....
Philadelphia	43.00	39.00	41.00	50.00-51.00	44.00-46.00	46.00	52.00-54.00
Pittsburgh	34.00-35.00	**37.00-38.00	.....	45.00-46.00	40.00-41.00	.....	52.00-54.00
St. Louis*	35.00	40.00	33.00	.....	.....	.....	41.00
San Francisco	40.00	46.00-47.00	28.00	45.00-46.00	40.00	.....	.....
Seattle	41.00	42.00	39.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

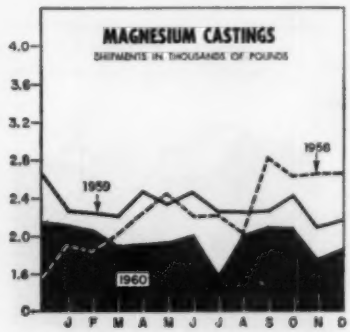
Foundry Statistics



PIG IRON

PRODUCTION**—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1958	1,622,320	2,448,917	4,954,854
1959	1,889,445	2,810,359	3,471,683
1960			
Jan.	128,232	325,151	462,667
Feb.	148,238	338,566	471,755
Mar.	126,357	333,182	462,914
Apr.	134,509	258,452	395,875
May	135,825	290,057	356,931
June	105,717	247,991	309,942
July	117,218	166,084	290,384
Aug.	78,950	171,718	211,506
Sept.	93,260	202,895	152,880
Oct.	133,525	183,639	208,758
Nov.	122,550	231,203	206,062
Dec.	130,455	153,009	202,353
Totals	1,454,836	2,904,918	3,736,608
1961			
Jan.	106,054	291,339	170,224



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[4])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[3]
1958	500,071	319,471	.....
1959			
Dec.	58,496	37,406	65,723
Total	631,210	443,009	.....
1960			
Jan.	61,537	39,777	64,940
Feb.	62,925	42,089	66,945
Mar.	60,816	39,618	60,267
Apr.	47,553	31,423	56,312
May	50,844	33,551	56,654
June	50,809	34,264	51,960
July	35,117	25,186	52,392
Aug.	45,101	32,549	57,551
Sept.	52,514	34,451	57,480
Oct.	56,205	36,459	57,023
Nov.	53,574	33,758	55,306
Dec.	46,029	29,341	51,518
Total	623,023	412,466	.....

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1958	3,314,652	169,267	231,145
1959			
Nov.	276,168	16,350	28,231
11 mo.	3,654,605	205,255	304,310
Dec.	334,524	18,613	47,045
Total	3,989,129	223,868	351,355
1960			
Jan.	325,242	18,634	45,936
Feb.	322,945	19,257	42,883
Mar.	317,520	21,042	43,959
Apr.	282,178	16,796	36,971
May	292,407	15,730	19,869
June	313,340	16,828	23,720
July	241,752	11,892	21,123
Aug.	273,722	14,697	27,919
Sept.	284,809	13,548	19,962
Oct.	269,103	13,631	13,947
Nov.	254,799	12,867	17,567
11 mo.	3,179,817	174,922	313,856

MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[4])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[3]
1958	28,776	25,024	.....
1959			
Dec.	2,154	1,721	3,423
Total	27,253	23,109	.....
1960			
Jan.	2,135	1,588	3,209
Feb.	2,075	1,679	3,278
Mar.	1,903	1,524	3,208
Apr.	1,926	1,533	3,138
May	1,953	1,514	2,948
June	2,050	1,555	3,396
July	1,638	1,234	3,541
Aug.	2,025	1,530	3,364
Sept.	2,146	1,653	3,271
Oct.	2,038	1,519	3,274
Nov.	1,776	1,269	3,433
Dec.	1,875	1,345	3,163
Total	23,540	17,943	.....

*Source: U. S. Dept. of Interior Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [3]For sale only. [3]Monthly figures do not add up to totals shohwn because of unreported monthly revisions.

For Cleaner Surfaces, Better Shakeout, Try WHITEHEAD'S NEW HYGEIA LYQUAFLOUR

Our new plant at Irwin, Pa., is producing the improved DUSTLESS DOUBLE STRENGTH HYGEIA LYQUAFLOUR. The compound of a special hydrocarbon and woodflour improves castings and mold conditions for all types of metal. Highly recommended for the advantages listed below:

- One sand additive controls both peel and expansion
- Good shakeout saves sand
- Imparts highest flowability to sand mixture to give pattern true finish
- 2% initial treatment of sand and as little as ¼ of 1% to reactivate does the job
- Replaces any carbon or hydrocarbon materials now used
- Eliminates dust at the muller
- Castings peel excellently which reduces cleaning room time
- Reduces penetration and burn-on
- Overcomes sand expansion defects, maintains good compression strength
- Improves molding, "feel", and "moldability"
- No rigid control required
- Permits hard ramming
- Less ramming required, more molds per hour
- Less temper water needed

Whitehead Brothers COMPANY

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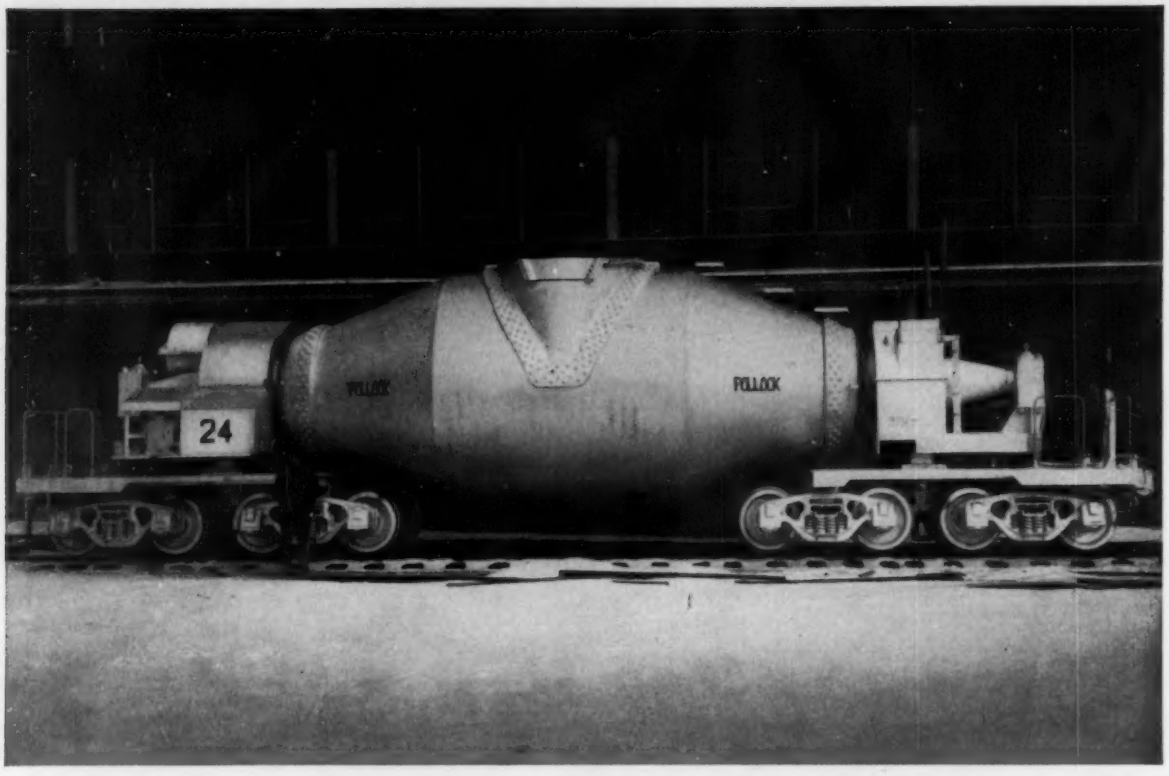
JOINT SEAL
Plastic compound for perfect sealing

LYQUAFACE
The liquid sand grain coating

DOB-IT
Ready-to-use core moulding compound

For More Information Circle 567, Page 39

Hot car rolls on cool bearings—



Weighing a whopping total of 360 tons, this car transports 200 tons of hot metal from blast furnace to refining unit. To be sure of cool running wheel bearings to make the car roll easier, take the terrific loads and shock, the car manufacturer—The William B. Pollock Co.—specified Timken® heavy duty "All Purpose" tapered roller bearings, the type used on more and more of America's freight cars. Because Timken bearings *roll* the load they practically eliminate friction. Cars start and roll easier, saving power. And because of their tapered design Timken bearings take *both* radial and thrust loads. No auxiliary thrust collars are needed. Timken "AP" bearings come pre-assembled, pre-lubricated, ready to install. They will go 4 years without adding lubricant. Maintenance is reduced, car availability increased. By reducing friction, they cut locomotive wheel spinning, decrease wheel wear, eliminate flat spots on rails and increase rail life.

YOUR SAVINGS MOUNT when you use the services of our graduate engineer salesmen. They'll work with you at the design stage, can often solve your bearing problems *on the spot.*

GREATER BEARING ACCURACY is assured through super-sensitive gages in our master gage laboratory, one of industry's finest. Some instruments measure even the thickness of several molecules.

The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO." *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.* Canadian Division: Canadian Timken, St. Thomas, Ont.

For More Information Circle 568, Page 39

San Francisco Congress Will Offer Variety of Attractions

The many and various attractions of the 65th AFS Castings Congress in San Francisco May 8-12 are rounding into final form as the convention date approaches.

As previously reported, the technical program, one of the most comprehensive ever presented, will include more than 100 papers covering virtually every phase of foundry operations. In addition, foundrymen will have the opportunity to visit more than 20 foundries in the area and to take a special tour of Mare Island Naval Shipyard.

San Francisco's Chinatown will attract many of the AFS visitors

Barbershop quartet singing will highlight the annual banquet, Wednesday, May 10, at the Sheraton Palace Hotel. Three different groups will perform, including The Californians, 1957-58 international championship barbershop chorus, The Bay Town Four, and the Jazzabelles, a girls' group.

The ladies program offers a variety of events to entertain wives who accompany their husbands to San Francisco. It includes a tea, a fashion show with an oriental theme, a continental breakfast followed by a behind-the-scenes visit to the city's finest shops, and a tour of the sights of San Francisco. AFS headquarters has reported that the post-convention tour to Hawaii has been sold out.

Gray Iron Specifications Tighter

● GRAY IRON foundries are being faced with increasingly stricter specifications for their products, and this trend likely will continue. This was the picture presented by speakers at a meeting of the Gray Iron Research Institute Inc. in Cleveland, Feb. 23.

The meeting, devoted to discussion of various aspects of engineering specifications for gray iron castings, was presided over by H. W. Ruf, vice president, Grede Foundries Inc., Milwaukee.

Some of the different specifications being imposed by customers were discussed by Norman L. Peukert, Carondelet Foundry Co., St. Louis. Casting properties covered by these specifications include chemistry, physical properties, machinability, dimensional tolerances and stability, surface finish, and soundness.

Certain new specifications offer a challenge to the individual foundry to demonstrate its superiority over its competitors, it was pointed out by L. J. Woehlke, Grede Foundries Inc. Although some requirements may appear unreasonable, there is always the threat that if foundries are unable to meet them, competing materials may do so. It is important, however, that foundries be compensated for additonal costs incurred in meeting special specifications.

Casting properties often can be improved materially through design changes, it was indicated by John B. Caine, castings consultant, Cincinnati. He described experimental work which shows the relationship of casting shape to metal strength.

Dan E. Krause, GIRI technical director, reviewed recent trends in specifications of technical societies, standards organization, and industries. "There is nothing apparent in the field of specifications which is going to make the life of a foundryman any easier," he said. "Competition from other materials is going to increase, and one means of forestalling a substitution is to

Speakers on the program of the Gray Iron Research Institute's recent meeting on trends in engineering specifications for gray iron included, left to right, Norman L. Peukert, F. E. Kasch, L. J. Woehlke, and Richard Allen

Other participants, left to right: John B. Caine, H. W. Ruf (chairman), Dan E. Krause, Charles F. Walton, and Tom W. Curry (president of the institute)

How Gene Miller upped wheel

Roland Garlick is a native-born Yankee who lives in Kansas City. As Production Manager of Neville Foundry Co., Inc., one of the biggest jobbing outfits of its kind in the K. C. area, he's a shrewd and hard-headed analyst of time and cost factors in every operation, and he expects his suppliers to be as careful about costs as he is.

That's one reason why he's so well satisfied with the results Bay State Abrasive Specialist Gene Miller gives him on grinding wheels . . . because Miller is as much production-minded as he is sales-minded.

Take the silicon carbide wheels they were using at Neville for general clean-up grinding on small castings, for example. Miller knew it was a good wheel but figured a combination of two different abrasives might do an even better job. He suggested a Bay State formulation that included both silicon carbide and aluminum oxide with a special grit size combination and asked Garlick to try it out.

The result was a full 20% increase in wheel life at the same cutting speed and, on top of that, a worthwhile reduction in the cost of the wheels themselves. As Roland Garlick says: "Bay State has always been Johnny-on-the-spot from the service point of view and they look at our problems from *our* point of view. That's what I like about them . . . that, and their grinding wheels, of course."

Like Gene Miller, your own Bay State representative and your Bay State distributor are thoroughly experienced, highly trained abrasive specialists. *Better grinding at lower cost . . . that is their business.*

(*Above*) Operator Ernest Ford cleans up cast strainer bodies with Bay State's long-lasting combination aluminum oxide/silicon carbide wheel.

(*Right*) Neville Foundry's Production Manager, Roland Garlick, examines finished surfaces of relatively complex gas regulator castings with Bay State's Gene Miller.

life and cut wheel costs, too, at Neville Foundry

Bay State Abrasive Specialist Gene Miller has spent 10 years working on just about every conceivable abrasive problem that might be encountered by any foundry or metal working plant. Part of his experience included valuable training at the distributor level. It is this wide, yet concentrated, experience that makes him so outstandingly useful to his customers.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

For More Information Circle 569, Page 39

(*Concluded from Page 23*)

provide castings of more uniform and improved properties."

Metallurgical requirements necessary to meet physical and engineering properties of gray iron castings were discussed by F. E. Kasch of the GIRI staff. He pointed out that although some castings present difficulties when certain requirements are specified, sensible and balanced specifications usually can be met with a reasonable degree of consistency.

Speaking on trends in quality control and inspection, Richard Allen, Dalton Foundries Inc., Warsaw, Ind., pointed to the development of an increasing number of tests concerned with physical properties, structure, graphite formation, and dimensional tolerances.

Charles F. Walton, technical director, Gray Iron Founders' Society, presented some of the new educational films produced by the society.

FEF Conference To Discuss Graduates' Industrial Role

The FEF graduate in industry will be the theme of the 14th annual College-Industry Conference of the Foundry Educational Foundation. It will be held at the Hotel Statler-Hilton, Cleveland, April 19-20.

The program is intended to demonstrate the growing need for engineering know-how, how engineers have contributed to foundries' technical progress, how the training at schools is applied in industry, and how the FEF is helping the foundry industry. All participants in the first day's program were FEF scholarship holders as students.

Program details follow:

8 a.m.—Breakfast and meeting of trustees and FEF professors.

10 a.m.—**The FEF Graduate in Industry:**
In Metallurgy, Dr. Rudolph W. Zillmann, MIT '49—metallurgist, Pittsburgh Steel Foundry Corp., Glassport, Pa. (Textron Inc.)

In Quality Control, Kenneth D. Carter, Case '52, director of quality control, Forest City Foundries Co., Cleveland.

In Plant Engineering, John Wasem, Ohio

(*Concluded on Page 29*)

SDCE Increases Membership, Elects Officers for 1961

J. L. MacLAREN

E. W. REARWIN

The Society of Die Casting Engineers, Detroit, reports that it experienced a 60 per cent growth in membership during 1960. The organization currently has ten chapters throughout the United States and expects to add more in 1961.

During 1960, the society also sponsored the first National Die Casting Exposition & Congress and is planning to sponsor the second in 1962. In addition, the group this year will initiate new programs designed to be of direct assistance to its diecasting members.

Officers for 1961 include the following: President, John L. MacLaren, Detroit sales engineer, Aluminium Ltd. Sales Inc., New York; vice president, Earle W. Rearwin, chief product engineer, diecasting machines, Reed-Prentice Div., Package Machinery Co., East Longmeadow, Mass.; secretary, M. R. Tenenbaum, Detroit sales engineer, Lester-Phoenix Inc., Cleveland; and treasurer, Lee G. Axford, manufacturing engineer, Ford Motor Co., Detroit.

BEFORE AND AFTER: A foundry's waste sand made it possible to transform this city dump at Berea, Ohio, into the site of recreational and municipal service facilities. The sand came from the nearby Cleveland Foundry of Ford Motor Co. Two other pits—abandoned quarries of Berea's once flourishing grindstone industry—also are being reclaimed by the dumping of Ford's used sand

...Fluid Power news

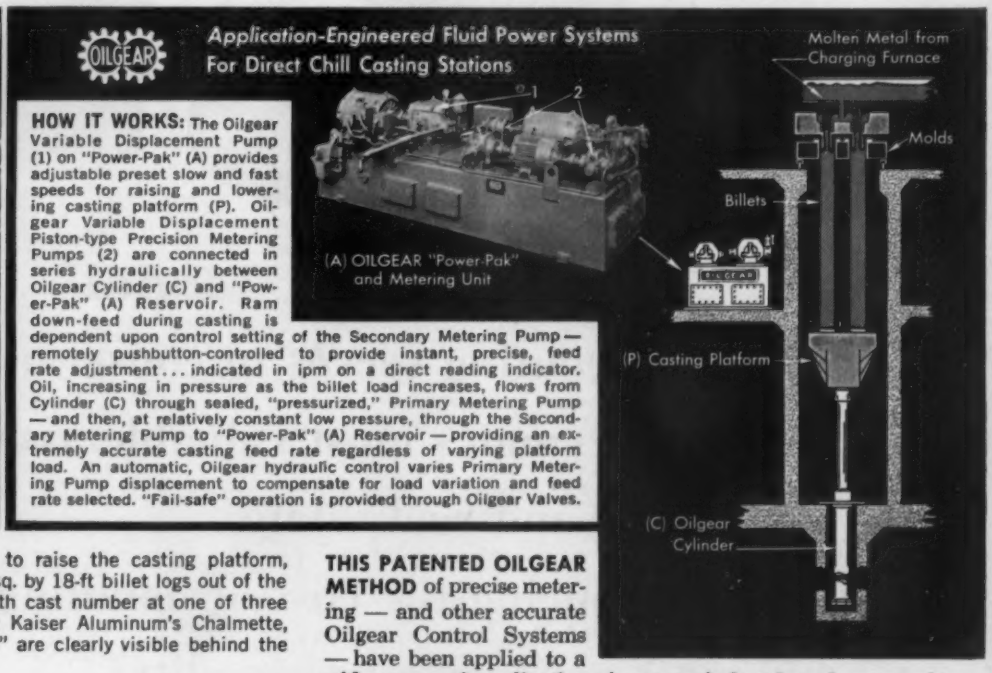
OILGEAR 40 Years of Fluid Power

From Oilgear *Application-Engineering* Files

HOW OILGEAR SYSTEMS IN KAISER ALUMINUM PLANTS AID DIRECT CHILL BILLET CASTING PRODUCTION

USER: *Kaiser Aluminum & Chemical Corporation*

PROBLEM: To supply direct chill billet casting platform power and control systems for production of a major portion of the 1,050,000,000 lb of aluminum consumed annually by domestic extruders. Direct chill billet quality — avoidance of internal cracking, homogeneity, grain structure fineness and orientation — depends on a smooth, unvarying, precise platform feed rate, careful control of pouring speed and temperature, cooling rate, and other variables to prevent atmospheric oxidation and impurities. Up to 32 billet logs over 18 ft long are to be produced in a single cast. POWER AND CONTROL SYSTEM REQUIREMENTS: 1. Remote pushbutton control of all functions. 2. Rapid platform traverse up and down. 3. Infinite "down" feed rate selection — unvarying regardless of casting platform load increase; chatter-free — unaffected by off-balance platform loads. 4. "Fail-safe" — insuring completion of a cast in event of power failure. 5. Must be simple, and assure long, trouble-free, dependable service.



HOW IT WORKS: The Oilgear Variable Displacement Pump (1) on "Power-Pak" (A) provides adjustable preset slow and fast speeds for raising and lowering casting platform (P). Oilgear Variable Displacement Piston-type Precision Metering Pumps (2) are connected in series hydraulically between Oilgear Cylinder (C) and "Power-Pak" (A) Reservoir. Ram down-feed during casting is dependent upon control setting of the Secondary Metering Pump — remotely pushbutton-controlled to provide instant, precise, feed rate adjustment... indicated in ipm on a direct reading indicator. Oil, increasing in pressure as the billet load increases, flows from Cylinder (C) through sealed, "pressurized," Primary Metering Pump — and then, at relatively constant low pressure, through the Secondary Metering Pump to "Power-Pak" (A) Reservoir — providing an extremely accurate casting feed rate regardless of varying platform load. An automatic, Oilgear hydraulic control varies Primary Metering Pump displacement to compensate for load variation and feed rate selected. "Fail-safe" operation is provided through Oilgear Valves.

Above: Rapid traverse is used to raise the casting platform, bringing, in this case, the 6-in.-sq. by 18-ft billet logs out of the casting pit for identification with cast number at one of three direct chill casting stations at Kaiser Aluminum's Chalmette, La., Works. Direct chill "molds" are clearly visible behind the "marker."

SOLUTION: Oilgear's patented Feed and Control System provides accurate volumetric metering of pressurized oil over a 200:1 pressure range, and a 100:1 feed range. Installations consist of an Oilgear Variable Displacement Pump direct-connected to an electric drive motor, two Oilgear Precision Variable Displacement Metering Pumps direct-connected to a double-end synchronous electric motor — all mounted on a custom-built reservoir base (A); and Oilgear piston- and ram-guided, chatter-free, *Custom-Quality* Cylinder (C); Oilgear Valves and Controls... all thoroughly, carefully *Application-Engineered.*

USER REPORTS — "Where accumulating load on the platform varied oil pressure from 50 to 1500 psi, and the rate of metering was preset anywhere from 50 to max. cipm, *there was no measurable change on the preset rate of casting feed during any portion of the stroke.*"

There has been NO major maintenance on these heavy-duty Oilgear Systems operating continuously in Kaiser Aluminum plants across the nation — some for over 7 years — and still "going strong."

THIS PATENTED OILGEAR METHOD of precise metering — and other accurate Oilgear Control Systems — have been applied to a wide range of applications in many industries where varying loads must not affect the speed of linear movement or hydraulic motor rotation. Carefully Application-Engineered Oilgear Systems — also used extensively on extrusion presses... aluminum foil laminating machines... stretching, forming, drawing and spinning presses... can-closing and filling machines... metal briquetting presses... ladle tilting, ingot manipulators, strippers, and scalpers — have all proved Oilgear equipment's traditionally long life, prompting users to state —

"for the lowest cost per year... it's Oilgear!"

For similar practical solutions to YOUR linear or rotary motion problems, call the factory-trained Oilgear Application-Engineer in your vicinity. Or write, stating your specific requirements directly to...

THE OILGEAR COMPANY

Application-Engineered Fluid Power Systems

1573 WEST PIERCE STREET • MILWAUKEE 4, WISCONSIN

Phone: Mitchell 5-6715... Direct Distance Dialing Code 414

For More Information Circle 570, Page 39

Shovel: 1961 Model

Pipe line routing serves to conserve the foundryman's most valuable asset: manpower and real estate, . . . by reducing the cost of handling his most expensive commodity: Sand

Can you afford to overlook the competitive advantages of reducing your sand handling costs?

Foundrymen who are aggressively waging the battle of cost vs. profit are winning—with National Air Conveyor Systems. Write for literature.

NATIONAL ENGINEERING COMPANY

646 Machinery Hall Building • Chicago 6, Illinois

P-561

(*Concluded from Page 26*)

State '50, plant engineer, Massillon Steel Casting Co., Massillon, Ohio.

In Research and Development, Nicholas Sheptak, Cornell '51, casting development engineer, Dow Metal Products Co., Midland, Mich.

12 noon—Luncheon: Annual Meeting

1:30 p.m.—**The FEF Graduate in Industry:**

In Design and Application: (a) For a Foundry (producer), Frederick J. Hodgson, Michigan State '54, chief product engineer, Eaton Mfg. Co., Vassar, Mich. (b) For a Customer Company (user), Bruce L. Harding, Michigan State '54, design engineer, Dynamac Inc., Natick Industrial Center, Mass.

In Technical Sales and Service: (a) To Foundries (Supplies and Equipment), John W. Rendall, Case '49, sales manager, Miller & Co., St. Louis. (b) For Foundries (Casting Sales), Ray H. Witt, Case '52, president, Ray H. Witt Industries, Detroit.

In Supervision and Management: (a) Medium-Large Foundry, William J. Parana, Case '51, chief metallurgist, Waukesha Foundry Co., Waukesha, Wis. (b) Small Foundry, Jack Thompson, Missouri School of Mines '52, foundry engineer, Bodine Pattern & Foundry Co., St. Louis.

In Education, Harry D. Bradshaw, Alabama '56, Wheelabrator Fellow '60—assistant professor, University of Alabama, Dept. of Metallurgical Engineering.

5 p.m.—Trustees Meeting

6 p.m.—Reception

Thursday, April 20

9 a.m.—**The FEF Undergraduate and the Foundry Industry:**

Summer Employment in Foundries . . . The Group Project Plan: 1) The company viewpoint, John H. Culling, executive vice president, Carondelet Foundry Co., St. Louis. 2) The student's viewpoint, John W. Lodenkamper, Purdue '61, student, metallurgical engineering.

10 a.m.—**Case Histories**—A review of successful summer employment programs.

10:20 a.m.—Discussion on summer employment.

10:45 a.m.—**The Engineering Undergraduate and the FEF program,** Paul Repas, Case '61, student, metallurgical engineering.

11:15 a.m.—**The Graduate Student in Cast Metals** (FEF—Wheelabrator Fellows) Ernest J. Poirier, MIT '60, student, graduate school, MIT.

12 noon—Luncheon: **Blueprint for the FEF Future,** Dr. David H. Morgan, president-elect, FEF.

Durez Patent Covers Coating Of Shell Molding Sand Mixes

Durez Plastics Div., Hooker Chemical Corp., North Tonawanda, N. Y., has been awarded a U. S. patent for a new sand coating process which is said to represent an important contribution to production of metal castings.

The patent was awarded to F. W. Less, Dr. J. C. Searer, and E. C. Roeck, all of Durez, and is regarded by the company as a major improvement in shell molding.

Operating procedures as outlined in the patent were introduced to the foundry industry in 1955 and have been in use ever since. According to Durez, the patented procedures have been and will continue to be shared with the American foundry industry.

Aluminum Anniversary Observed

● AS A PART of the winter meeting of the Aluminum Association, held in Cleveland, members of that organization made a pilgrimage to Oberlin, Ohio, on Feb. 16 to pay tribute to Charles Martin Hall on the 75th anniversary of his discovery of the electrolytic process for reducing aluminum.

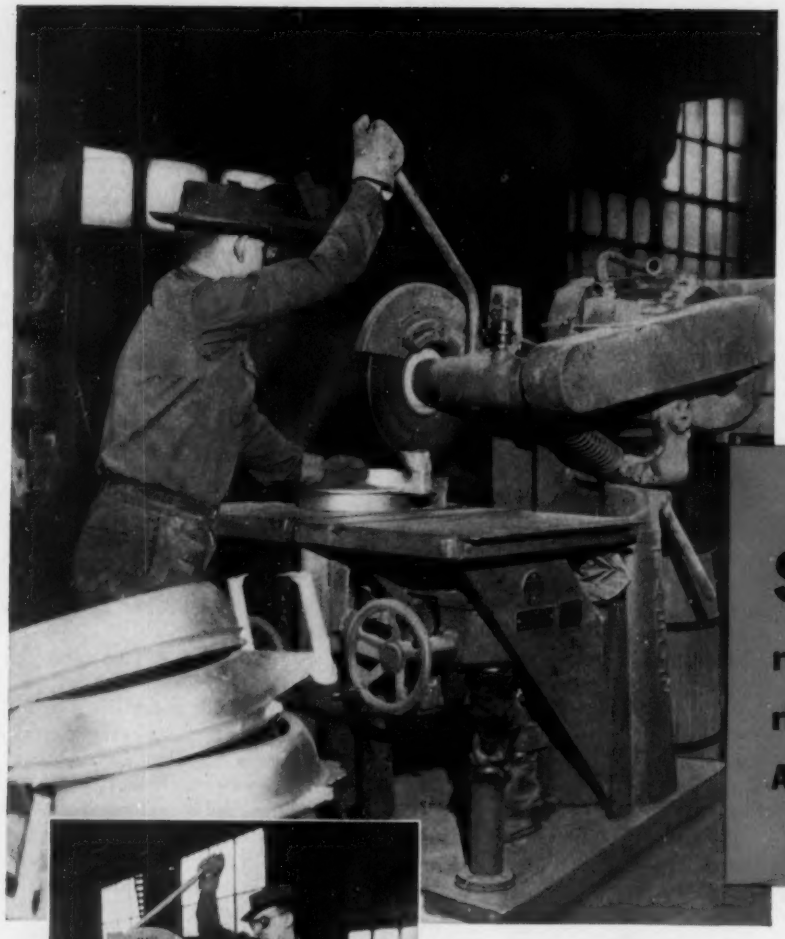
The program for the anniversary celebration included an "Aluminum Round Table of Tomorrow" in the Sophronia Brooks Hall Auditorium at Oberlin College. Dr. Robert K. Carr, president of Oberlin College, and M. M. Anderson, president of the Aluminum Association, told how young Hall, at the age of 22, developed the process in the woodshed adjoining the kitchen of his home a short distance from the Oberlin campus.

Everett G. Fahlman, chairman, Permold Co., Medina, Ohio, and former board chairman of the Aluminum Association, presented an aluminum plaque to Dr. Carr in token of a permanent aluminum museum display which the association will donate to the college as soon as construction is completed on the new Hall of Science.

Roundtable talks included "Aluminum in Construction and Building," by Philip Will Jr., president, American Institute of Architects; "Aluminum in the Electrical Field," by Philip Sporn, president, American Electric Power Co., New York; and "Aluminum on the Move," by Dr. W. A. Pennington, president, American Society for Metals, and professor of metallurgy, University of Maryland.

Also, during the winter meeting, the association elected new officers. The aluminum foundry division re-elected Arthur L. Fischer, president, Fischer Casting Co., Dunellen, N. J. to be chairman. J. Frank Seeley, division sales manager for foundry products, Bohn Aluminum & Brass Corp., Detroit, Mich., was elected vice chairman, and John E. Fahlman, president, Permold Co., Medina, Ohio, was re-elected representative to the board of directors.

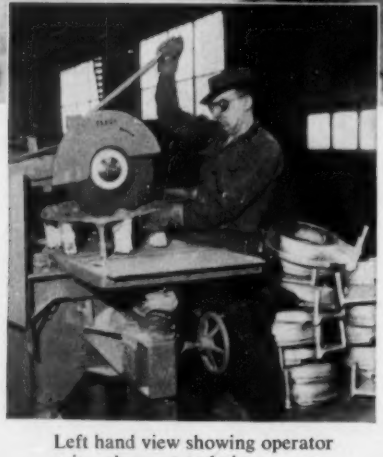
WINNERS: Apprentice contest of the Oregon Chapter, AFS, produced these four winners among 17 entries. Winners in the various divisions are, from left, Don Sprague, Columbia Steel, steel molding; Erich Stuchlik, Western Foundry, iron molding; Don Nealeigh, Oregon Brass, nonferrous; John Rondema, Western Foundry, wood pattern. The entries also are entered in the national contest



Installation using chop-cut method at Kelly Foundry, Utica, N. Y., to remove gates and risers from aluminum castings on Tabor-Brasive Cut-Off machine.

Saves $3,364

removing gates and risers from 600 Aluminum Castings



Left hand view showing operator using chop-cut technique.

A new Tabor-Brasive Cut-Off Machine paid for itself on one job at Kelly Foundry & Machine Co., Utica, N. Y. Facts and figures are given at right.

James S. Kelly, president, says:

"We have virtually abandoned band-saw cutting of aluminum castings. In addition to reducing cutting time, the Tabor machine gives a clean cut through heavy sections, and eliminates the grinding operation.

"Formerly, we did not remove gates and risers until after cleaning since sand adhering to skin of castings would dull band-saw blades. Now we cut first, and get more castings in the wheelabrator. By cleaning light section aluminum castings after cutting, we have eliminated distortion previously caused by the twisting and turning of gates and risers."

Bulletin on complete range of Tabor-Brasive Cut-Off Machines sent promptly on request.

With cutting head of Tabor-Brasive Cut-Off machine locked in position, operator uses push-cut method.

How it was done:

THE JOB: 600 aluminum castings, weighing 80 lbs. each, net. 4 risers (24 sq. inches of metal) to be removed from each casting.

BANDSAW METHOD: 2 men could remove risers from 13 castings per day. 92 days cutting time @ labor cost of $15 per day.	$1,380.00	
Grinding time: 92 days @ labor cost of $15 per day	1,380.00	
150 band-saw blades @ $4.80 per blade	720.00	
	$3,480.00	$3,480.00
TABOR CUT-OFF METHOD: 1 man could remove risers from 106 castings per day. 45 hours cutting time for 600 castings @ labor cost of $2 per hour	$90.00	
Grinding time: No grinding required with Tabor Cut-Off.		
2 cutting wheels @ $13	26.00	
SAVING WITH TABOR CUT-OFF METHOD . . . $3,364.00 without considering equipment wear and power savings over 184 days, wheelabrator space saved, and the elimination of distortion in the castings.	$116.00	$116.00
		$3,364.00

The new C10AF Tabor Cut-Off more than paid for itself on this one job. Now Kelly Foundry uses the Tabor Cut-Off for 95% of all work, saves $500 per month in band-saw costs.

TABOR
TRADE 1884 MARK

TABOR MANUFACTURING CO.
Division of Turbo Machine Company
LANSDALE, PENNSYLVANIA

because we're more than the name implied... Foundry Services, Inc. has changed its name to

FOSECO, INC.

We feel that the new name, already well established in the metal-pouring industry, more nearly encompasses our full range of services—to steel mills, to smelters, to wrought metal producers, as well as to foundries.

In making the change, we become even more closely identified with our Foseco product line, a symbol of quality throughout the industry.

Please refer to us as FOSECO, INC. after March 31. And continue to look to FOSECO INC. for new product development, expanded metallurgical research and competent technical assistance with any metal-pouring problem.

FOSECO, INC.
P.O. Box 8728
Cleveland 35, Ohio

Exothermic Riser Compounds • Hot Tops • Degassers • Alloying Additives • Coatings • Deoxidizers • Inoculants • Grain Refiners • Protective and Drossing Fluxes

Calendar of MEETINGS

April 9-13—American Industrial Hygiene Association, conference, Sheraton-Cadillac Hotel, Detroit.

April 10-12—American Institute of Mining, Metallurgical & Petroleum Engineers, Open Hearth Steel Conference, Sheraton Hotel, Philadelphia.

April 17-21—American Welding Society, Annual Meeting & Welding Show, Commodore Hotel and Coliseum, New York.

April 18—National Castings Council, annual meeting, Statler-Hilton Hotel, Cleveland.

April 18—Hoist Manufacturers Association, Statler-Hilton Hotel, Detroit.

April 18-20—Foundry Educational Foundation, annual college-industry conference, Hotel Statler-Hilton, Cleveland.

May 1-2—American Zinc Institute, annual meeting, Drake Hotel, Chicago.

May 8-12—American Foundrymen's Society, Castings Congress, San Francisco.

May 9-11—Material Handling Institute, Eastern States Show, Trade and Convention Center, Philadelphia.

May 15-17—British Investment Casters' Technical Association, annual conference, London, England.

May 17-19—Society for Nondestructive Testing, Eastern Regional Convention, Sheraton-Mount Royal Hotel, Montreal, Quebec.

May 22-25—American Society of Mechanical Engineers, Design Engineering Show, Cobo Hall, Detroit.

June 5-7—American Society for Quality Control, annual convention and exhibit, Sheraton Hotel, Philadelphia.

June 8-9—Malleable Founders' Society, annual meeting, Broadmoor, Colorado Springs, Colo.

June 13-14—Connecticut Safety Society, annual meeting, Statler-Hilton Hotel, Hartford, Conn.

June 18-20—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

June 20-21—Investment Casting Institute, technical course, Case Institute of Technology, Cleveland.

June 22-24—Penn State Regional Foundry Conference, Pennsylvania State University, University Park, Pa.

June 25-30—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Sept. 18-20—Non-Ferrous Founders' Society, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21—Cast Bronze Bearing Institute, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 24-26—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 27-28—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Oct. 7-10—Conveyor Equipment Manufacturers Association, annual meeting, Ponte Vedra Inn, Ponte Vedra Beach, Fla.

Oct. 18-20—Gray Iron Founders' Society, annual meeting, Royal York Hotel, Toronto, Ont.

Oct. 19-21—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 23-27—American Society for Metals, National Metal Congress & Exposition, Cobo Hall, Detroit.

Nov. 13-15—Steel Founders' Society of America, Technical & Operating Conference, Hotel Pick-Carter, Cleveland.

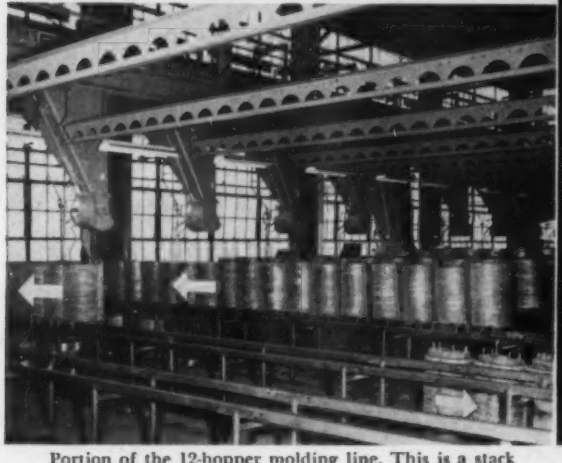
Nov. 15-17—National Foundry Association, annual meeting, Savoy-Hilton Hotel, New York.

Nov. 17-18—East Coast Regional Foundry Conference, New York.

Dec. 6-8—American Institute of Mining, Metallurgical, & Petroleum Engineers, Electric Furnace Conference, Penn-Sheraton Hotel, Pittsburgh.

For More Information Circle 573, Page 39

This Newaygo Sand System with Newaygo **MULTI-LEVEL CONTROL,** installed recently at SEALED POWER CORPORATION, Muskegon Heights, Michigan automates a high production system for small gray iron castings suitable for a stack molding process. Circular sand storage bin, with Newaygo Plate Feeder, feeds sand to skip hoist for loading the muller. Operations from tank, through muller to distribution belt, are controlled by the Newaygo specially designed combination Motor Control and Multi-Level Panel, which works in conjunction with a No. 3917 Dietert "End Point" Moisture Controller and Automull. This allows fully automatic operation of sand handling system, from shakeout to molders' hoppers.

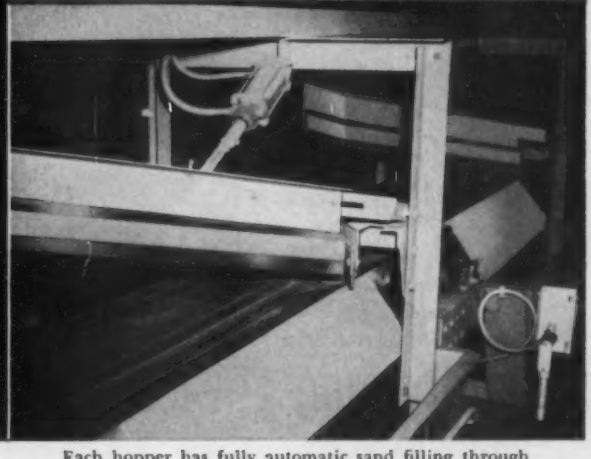


Portion of the 12-hopper molding line. This is a stack molding operation, with empty flasks returning to molder on dolly cars at high level. The same dolly cars are used to take a stack of unpoured molds through the pouring zone, with tracks at floor level.

Foundries step up ***QUALITY*** *of castings and* ***QUANTITY*** *of molds with* **NEWAYGO** *equipment!*

More molds ON THE MOVE make money! Automation by Newaygo keeps molds on the move!

Here's MORE proof of Newaygo's Leadership in "packaged" sand handling units!



Each hopper has fully automatic sand filling through the use of the Newaygo Multi-Level Control System.

"The automation of our small casting department has more than doubled our capacity in the same floor space. We have made significant cost reductions and have attained a high and predictable level of quality. Newaygo has contributed excellent equipment plus engineering assistance and know-how to make this program a success." — John A. VanHaver, Foundry Manager, Sealed Power Corporation.

Write, phone or wire for a Newaygo Representative to help you.

These will help YOU

MOVIE "Progressive Mechanization", featuring HANDY SANDYS in 9 foundries . . . . MOVIE "Newaygo Pallet Systems for Mold Handling", many types of installations in foundries . . . Our magazine "SAND SCRIPTS" . . . Bulletins: No. 60 on Pallet Line Systems of Mold Handling . . . No. 59 on HANDY SANDYS . . . No. 56 on Newaygo Sand and Mold Handling, and Mold Making Equipment.

Performance and durability are built into every piece of NEWAYGO equipment.

NEWAYGO **engineering company**
NEWAYGO, MICHIGAN

. . . and profitable, too, with NEWAYGO MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

Also Manufacturers and Installers of MULTI-LEVEL HOPPER CONTROL SYSTEMS, CAR CONVEYORS, APRON CONVEYORS, ROTARY FEEDERS and FOUNDRY AUTOMATION

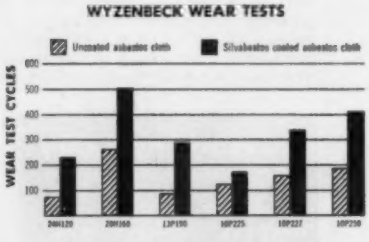
Foundry men get longer wear with Silvabestos®

Don't settle for ordinary asbestos gloves. Ask for genuine R/M Silvabestos®—the glove cloth that gives you *double* the wear.

Specially made to resist wear from highly abrasive materials, Silvabestos also retains up to 56% more tensile strength than comparable grade uncoated asbestos cloth after repeated exposure to high heats. And with all its ruggedness, Silvabestos gives you the kind of glove flexibility you want.

R/M makes the cloth—your safety garment supplier makes the gloves. Be sure to ask him for genuine R/M Silvabestos in gloves and other safety clothing . . . or write us for the list of manufacturers who fabricate Silvabestos.

Superior wear of Silvabestos (black bars) vs. uncoated asbestos cloths of the same grades is shown in test findings at right. *Note:* Silvabestos should not be used in contact with open flame.



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R/M

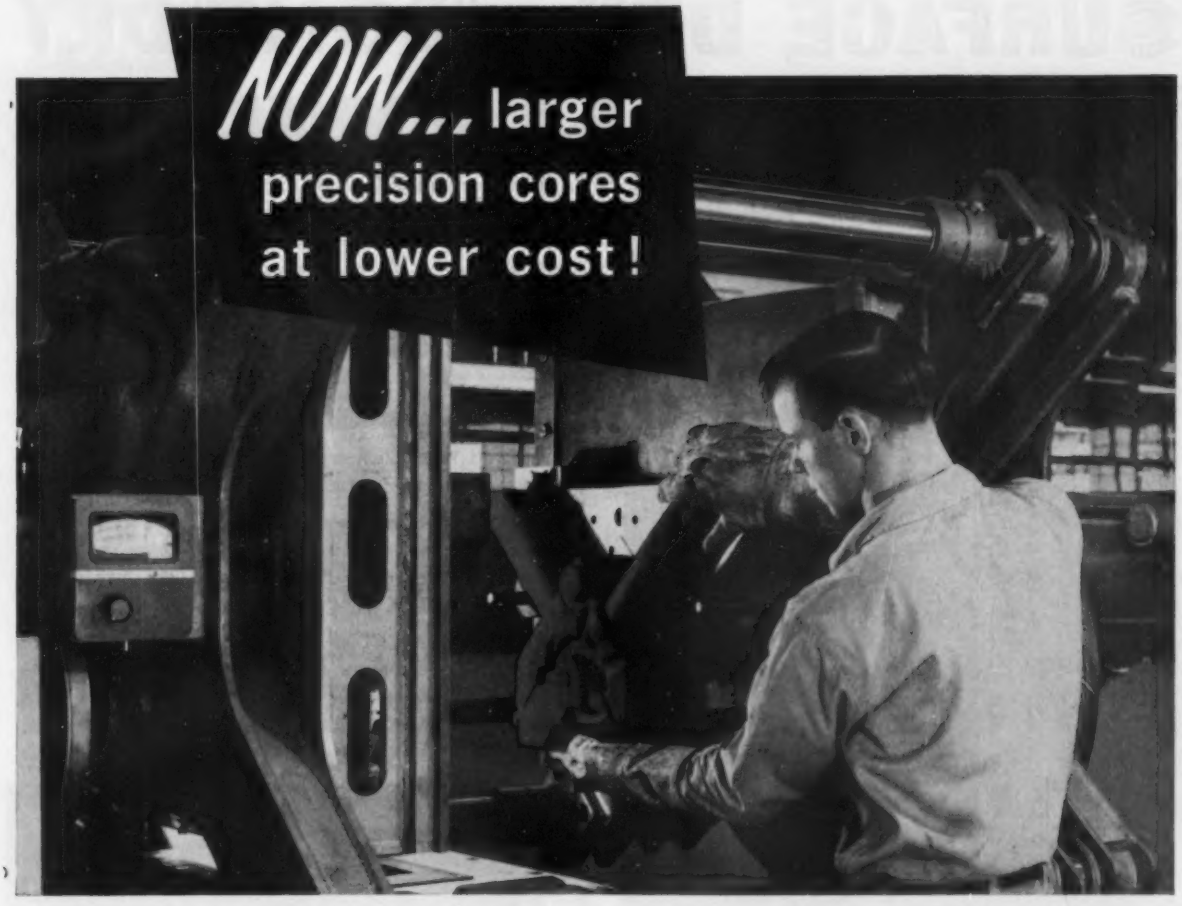
ASBESTOS TEXTILE DIVISION

RAYBESTOS-MANHATTAN, INC.

Manheim, Pa.

SPECIALISTS IN ASBESTOS, RUBBER, ENGINEERED PLASTICS, SINTERED METAL

For More Information Circle 575, Page 39

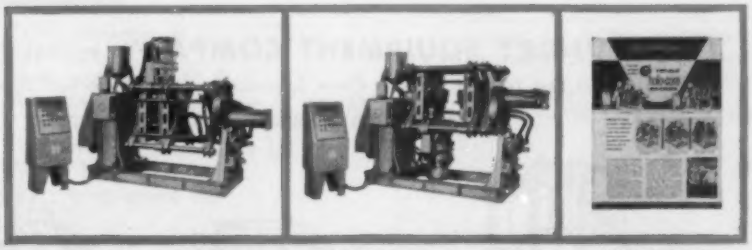


...with a SPO fully automatic TOP BLOW holo-core machine

Model SC-100 has a blow capacity of 100 pounds of sand . . . will mass produce large single-cavity hollow cores or a wide range of small cores in multi-cavity boxes . . . cores are delivered ready-to-use in 90 seconds or less depending on complexity. Large platens take core boxes up to 24" x 30" x 14". Outstanding speed, simplicity, safety and economy are guaranteed operating advantages.

Other features include automatic gravity sand feed . . . integral direct-acting springless stripping mechanism . . . blow, dwell, drain-out and cure cycles that are timer-controlled and independently adjustable . . . gas-fired ovens are thermostatically controlled . . . simplified core box mounting . . . and shock-resistant heavy-duty construction throughout.

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES



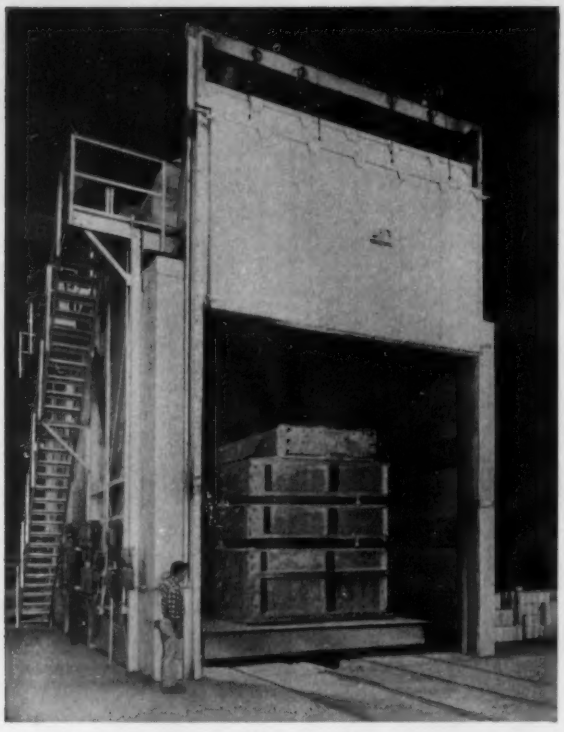
SC-100 in Blow Position | SC-100 in Strip Position | Write today for your copy of Bulletin SC-200

SPO INCORPORATED

6449 Grand Division Ave. • Cleveland 25, Ohio

For More Information Circle 576, Page 39

SURFACE DRY or "BONE" DRY
COLEMAN OVENS

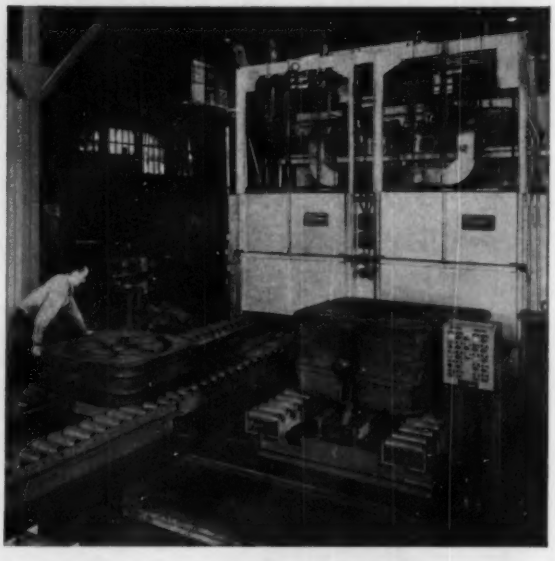


Dry Molds Best!

Below: Two Coleman *JET-ACTION®* High Speed Mold Ovens in a gray iron foundry dry up to 60 molds per day.

Ingenious push button controls enable one operator to index cope and drag molds through the oven on a semi-continuous conveyor system. Ovens are heated by individual *JET-ACTION®* Recirculating Systems.

Coleman *JET-ACTION®* Ovens provide such benefits of dry sand practice as better casting finish—fidelity to pattern—lower cleaning costs with added advantages of reduced handling costs and accelerated flask turnover.



Above: Car-Type Mold Oven in leading steel foundry is one of the largest in the world. Door opening is 16 feet wide x 18 feet high; useful inside work space is 11,000 cubic feet!

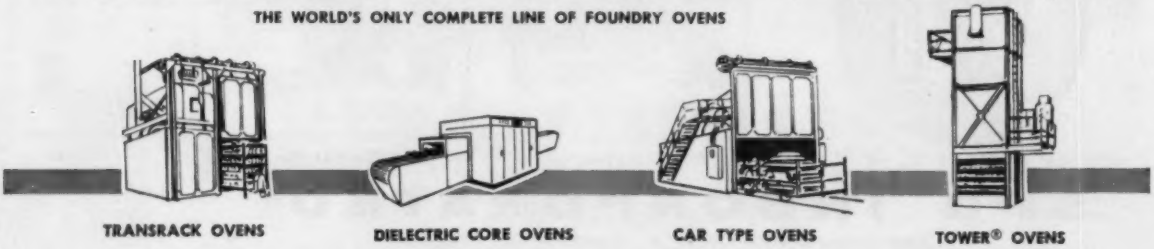
Combination gas and oil fired recirculating air system provides heating capacity to "bone" dry a 300 ton load of molds at temperatures up to 800° F. Heavy duty, sub-floor car moving system and doors at each end of oven are push button controlled.

Write for Bulletin 54.

THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists — More than half a century of specialized foundry experience.

THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS | **DIELECTRIC CORE OVENS** | **CAR TYPE OVENS** | **TOWER® OVENS**

FOUNDRY

Reader Information Service

Advertising content is classified by subject and listed by page number for your convenience when studying specific foundry applications. For further information on subjects advertised, refer to advertisement on the page indicated and circle Item Number on Reader Service Card —Page 39.

SUBJECT INDEX

Abrasives (shot and grit) 51, 181
Abrasive wheels 24-25, 45, 180, 185
Air blast control 161
Alloying agents (ferrous metal) IFC, 1, 52, 117, 180
Alloying agents (nonferrous metal) 32, 52
Aluminum alloy ingot 8-9, 111, BC
Associations and Societies 104, 201

Bearings 22
Binders (oil) 125
Binders (resin) 2, 6-7, 41, 148-149, 171
Binders (sodium silicate) 182, 186
Blast cleaning equipment 49, 50, 95
Blowers 144, 152
Boards and Plates 87
Burners 144

Casting machines (permanent mold) 188
Casting machines (pig) 164
Chaplets, Chills, Nails 46-47, 128
Charging machines (furnace) 202
Coatings (core and mold) 32, 140
Coke 93, 120, 127, 188
Compressors (air) 145
Conveyors 12, 28, 33, 48, 119, 159
Corbox Cleaners 188
Coreblowing machines 35, 53, 130, 133, 143
Cranes 138, 183, 202
Crucibles and Pots 136
Cupolas 202
Cutoff equipment 30-31
Cylinders (air and hydraulic) 27

Degasifiers and Deoxidizers 32, 107
Dressers 160
Dust control equipment 49, 157, 189

Electrodes (furnace) 56
Electrodes Spectrographs 165
Engineering services 106, 187, 188
Exothermic products 32

Fabricators (metal) 184
Filters and Separators (compressed air) 146
Finishings (for castings) 189
Flasks and related equipment 44, 88, 168
Flour 21, 200
Fluxes 32, 139
Furnaces (all types) 42-43, 97, 116, 123, 144, 153, 169, 179, 187

Grinding Machines 105, 158, 166

Hoists 138
Hot Blast equipment 202

Ingot molds 136
Iron Powder and Briquets 198

Ladles 108, 202
Lubricants 132

Molding machines (green sand) 13, 90-91, 113
Monorails 202

Nickel alloys 1

Ovens (all types) 36, 115, 185

Paste (core) IBC
Patterns and equipment 186
Pebbles 189
Pig iron 5, 54-55, 120, 174, 178
Portable tools (electric and pneumatic) 105
Pouring devices 138
Pumps (liquid) 27
Pumps (vacuum) 184

Radiographic equipment and supplies 137, 200
Rammers, Butts, Peins 185
Refractory gating components 10, 122, 189
Refractory lining materials 101, 173
Release agent 154
Rollover draw machine 177
Rollover machine 124

Safety equipment 34
Sand 200
Sand handling 28, 33, 48
Sand preparation equipment 11, 33, 99, 129, 147, 155, 184, 189
Sand reclamation equipment 134
Screens 134, 184
Spraying equipment 188

Testing equipment 11, 116, 158, 186, 189
Trucks and Front-End Loaders 14-15, 163, 172

Vacuum Cleaner 152
Valves (air and hydraulic) 16
Vents (corebox) 187

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Just mail one of these cards—for more information on anything advertised in this issue . . . for further data on products described in the Equipment and Supplies section (Page 89) . . . to get copies of publications listed in the Literature for Foundrymen section (Page 135) . . . to request extra copies of editorial articles.

Index of Equipment and Supplies & Literature for Foundrymen, by Item Numbers

Equipment and Supplies Section (Page 89)

PRODUCT	ITEM NUMBER
Core Truck	451
Large Zinc Pigs	452
Bucket Conveyor	453
Abrasive Products	454
Ultrasonic Tester	455
Control Unit	456
Ceramic Insulating Brick	457
Band Saw Blade	458
Hinged Steel Belting	459
Aluminum Cleaner	460
Grinding Wheel Dresser	461
Motorized Crane Kit	462
Fork Lift Scale	463
Variable Speed Drive	464
Epoxy Adhesive	465
Zinc Diecasting Alloy	466
Compact Air Cylinder	467
Diecasting Quench	468
Cable Processing Press	469
Air Make-up Unit	470
Plastic Filler	471
Air Compressor	472
Resistance Furnace	473
Zinc Diecasting Machine	474
Sandblast Nozzle	475
Leveling Machinery Mount	476
Axial Flow Fans	477
Adjustable Motor Bases	478
Fiberglass Cloth	479
Ceramic Choke Bushing	480
Moisture Extractor	481
Standup Tractor Shovel	482
Shell Coreblower	483
Cutoff Turntable	484
Flask Straightener	485

Literature for Foundrymen Section (Page 135)

PRODUCT	ITEM NUMBER
Sand Binder	402
Shell Core Machines	403
Castable Ceramic Fiber	404
Ferroalloys	405
Gating Zinc Diecastings	406
Aluminum Alloys	407
Olivine Aggregate	408
Bulk Handling Conveyor	409
Rust Removal and Prevention	410
Wire Rope	411
Dust Collection	412
Belting	413
pH Meters	414
Couplings	415
Vacuum Melting	416
Fire Fighting Equipment	417
Castable Refractory	418
Poppet Valves	419
Diecasting Lubricants	420
Platform Truck	421
Air Conditioners	422
Rubber Products	423
Abrasive Discs	424
Brakes	425
Dry Ice Converters	426
Load Indicator	427
Vibrating Shaker	428
Infrared Heating Unit	429
Wetting Agent Systems	430
Pushbutton Stations	431
Flexible Hoses	432
Truck Leasing Plan	433
Furnace Burners	434
Metal Cleaning and Finishing	435
Industrial Fans	436
Aluminum Degassing	437
Safety Equipment	438
Permanent Magnetic Drums	439
Metal Buildings	440
Clamping Cylinders	441
Blast Cleaning Barrels	442

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401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
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And you can get expert guidance in applying these materials to the job. Our technical representative will be glad to discuss the different uses for BAKELITE Brand foundry resins for shell and core molding. Contact the office nearest you, or write Dept. KP-52D, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Ave., New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.

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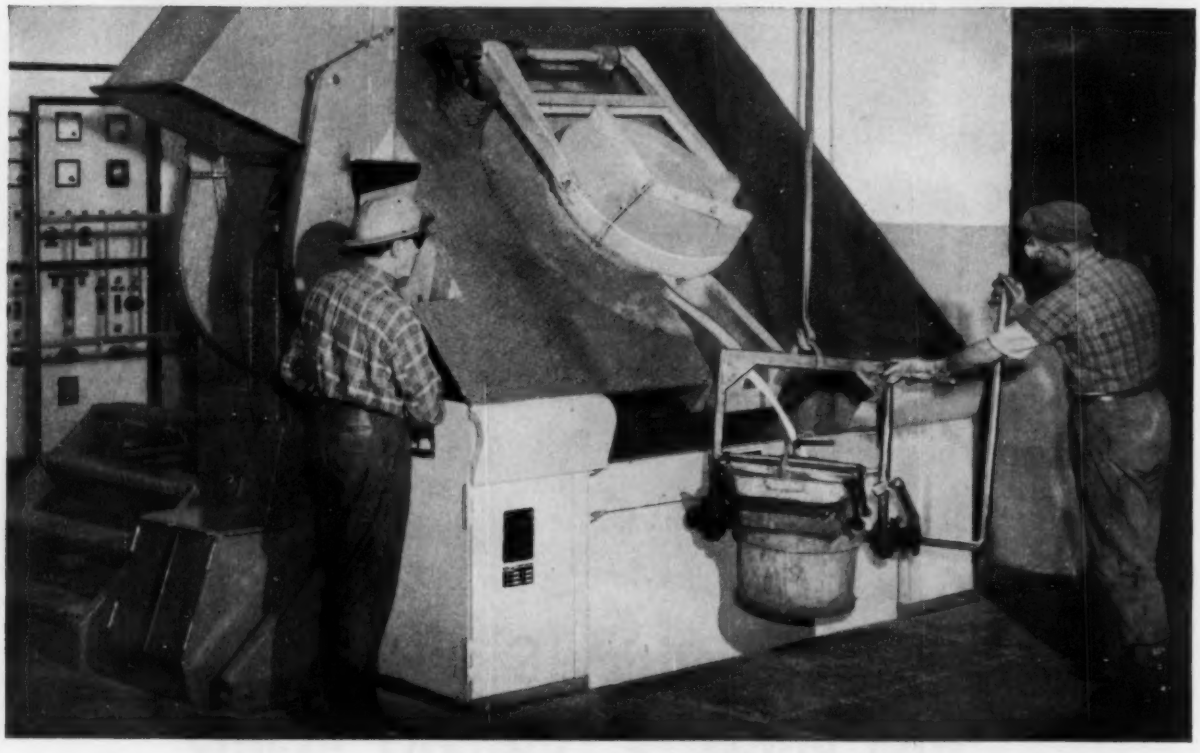

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FASTER MELTS: electromagnetic stirring, thorough mixing and uniform heat throughout the bath.

HIGHER QUALITY: exceptionally clean melts with minimum contamination and metal loss.

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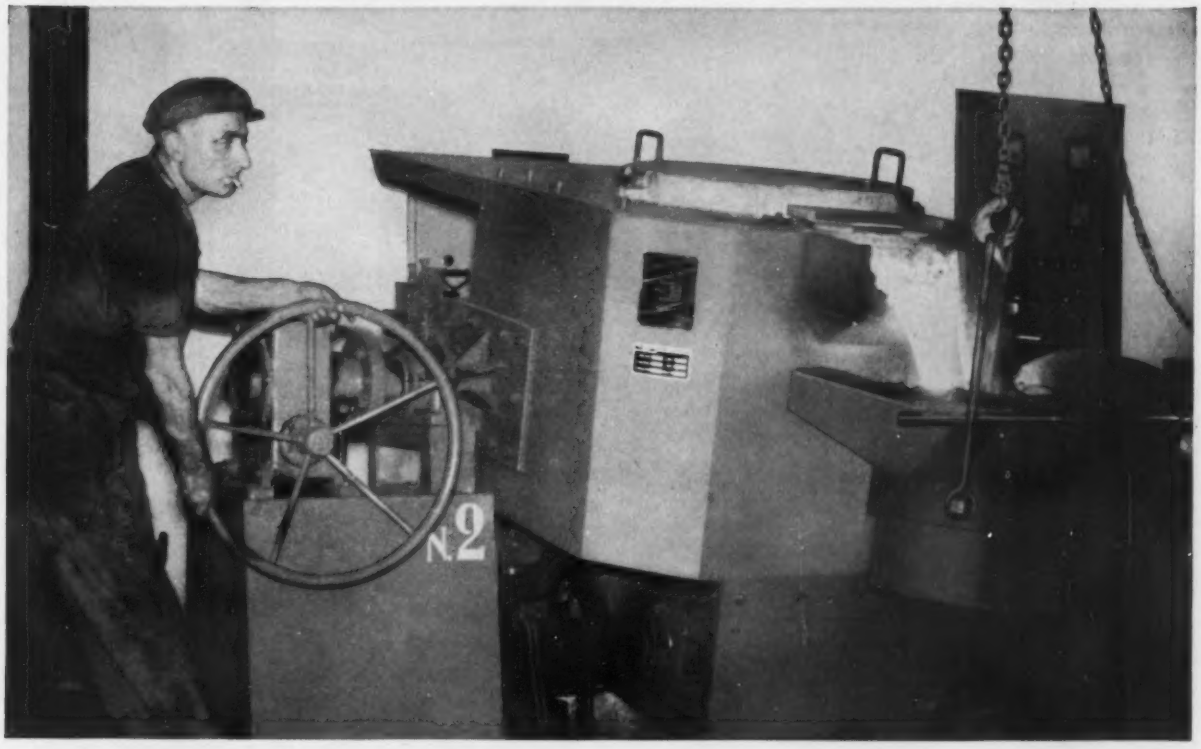

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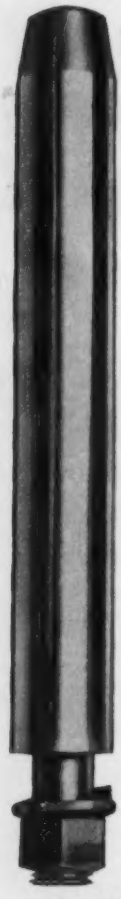
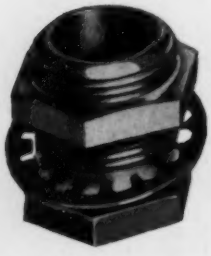
For More Information Circle 579, Page 39



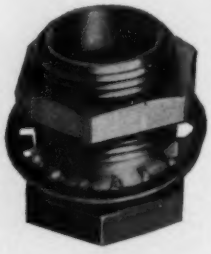
Adams Round Pin
Hardened, Ground,
Hard Chrome Plated

Adams
Round Bushing
(End View)
Open

Adams
Elongated Bushing
(End View)
Hexagon Pin Inserted



Adams
Round Bushing
Nut and Lock Washer
Long Flask
Short Plate



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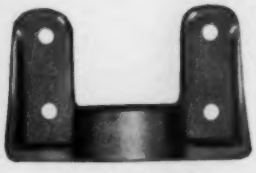

Adams Hexagon Pin
Hardened, Ground,
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Adams Pins and Bushings for Cherry and Aluminum Flasks assure you top quality and precision for close tolerance operation.

Proper mountings for pins and bushings for all Cherry Flasks are offered to meet practically all of your requirements.

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Bushing Mountings
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A wide variety of pin arrangements is included to complete our line. Write us at once for full information.

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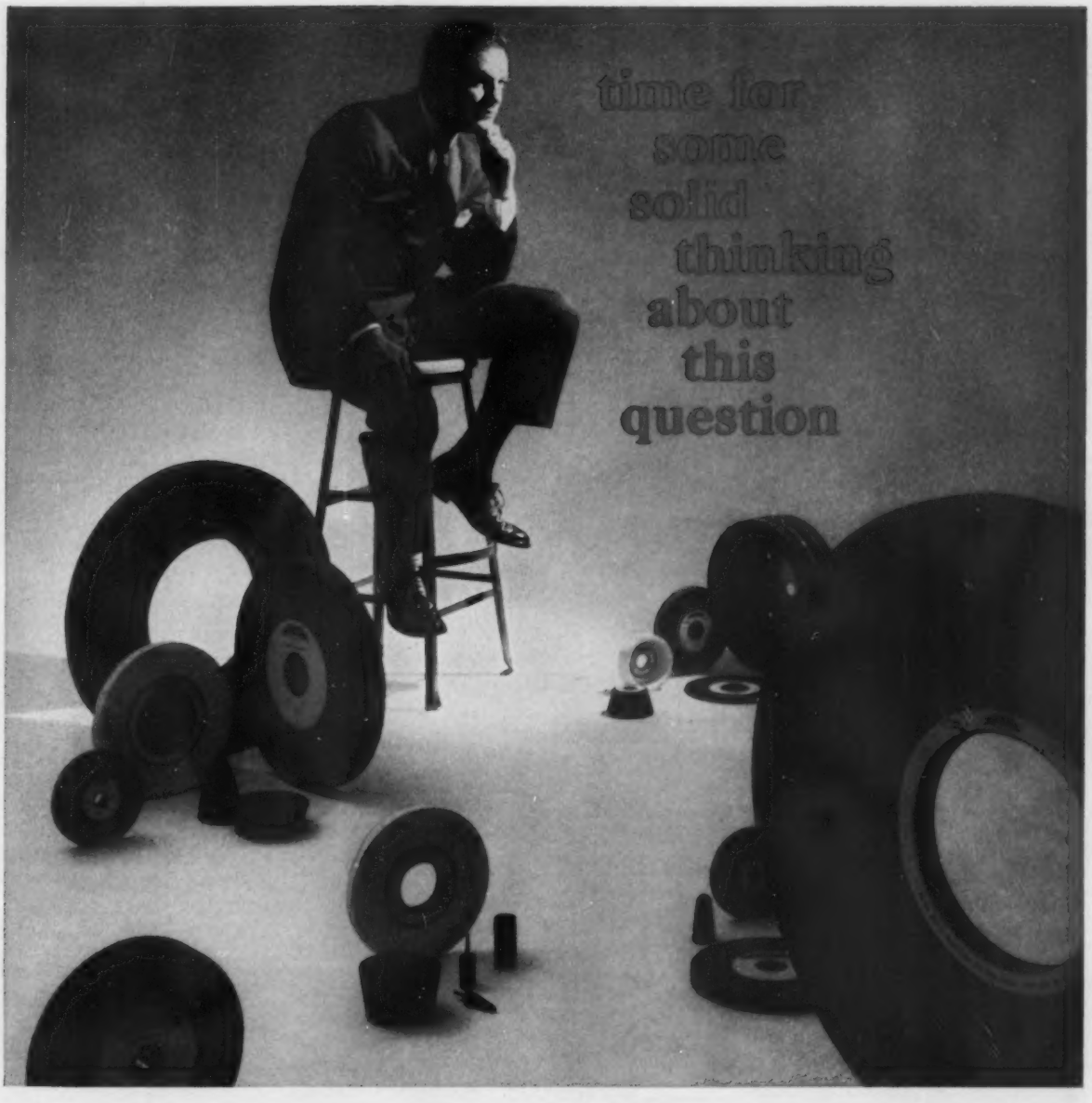
MOLDING MACHINES and FLASK EQUIPMENT



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For More Information Circle 581, Page 39

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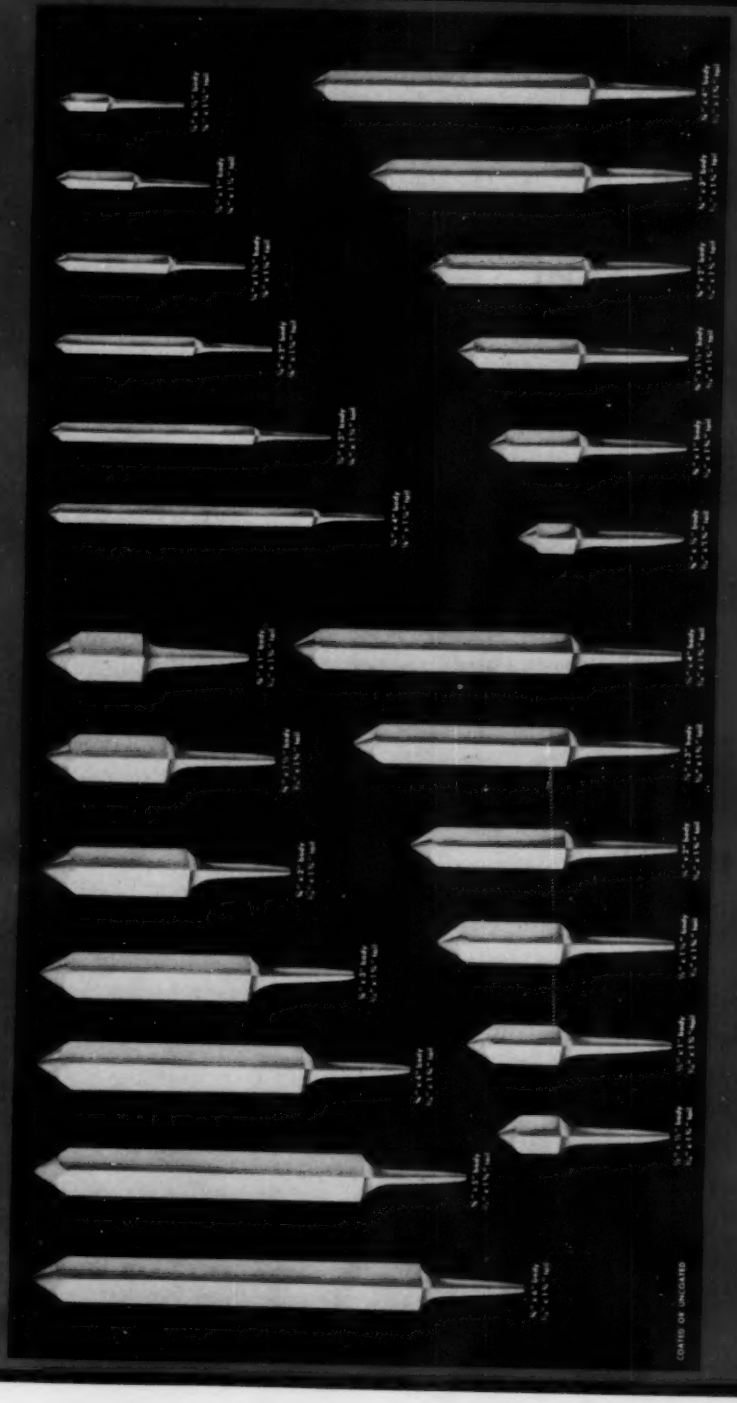

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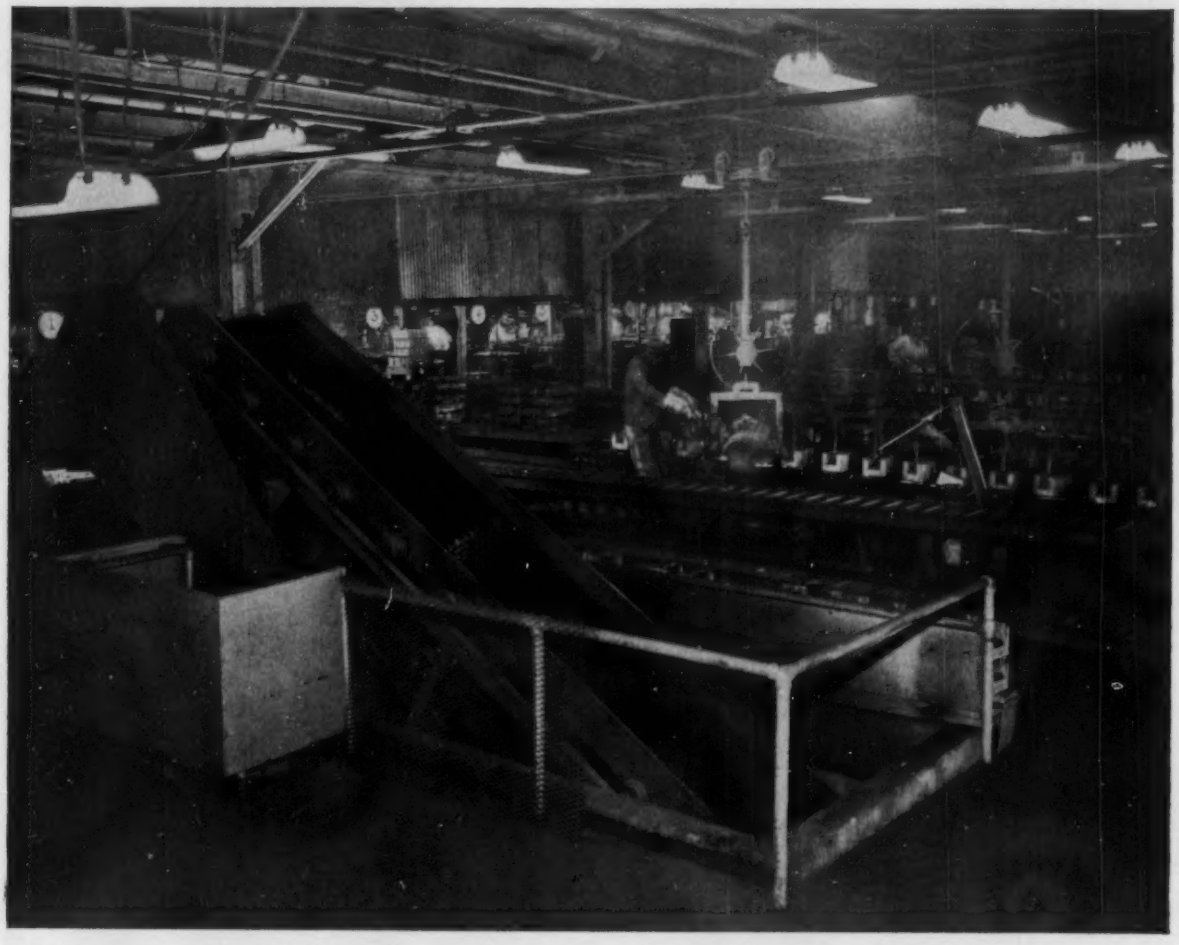
For More Information Circle 582, Page 39

"Our Jeffrey system permits closer control over sand mixes"



"Castings are uniformly higher in quality and appearance," reports Acheson Manufacturing Company, Rankin, Pennsylvania. "With the closer control of core and molding sands, causes of casting defects are easier to identify and correct."

Early in 1959, this company instituted the initial stage of its foundry modernization program. Jeffrey was invited in, engineering was rapid and by November the equipment was at work. A fully equipped sand laboratory was installed and sand handling was completely changed over from manual to mechanical handling.

Consult Jeffrey foundry engineers on your sand systems, mold preparation and conveying equipment, castings handling and special machines. For illustrated Catalog 911, write The Jeffrey Manufacturing Company, 907 North Fourth Street, Columbus 16, Ohio.

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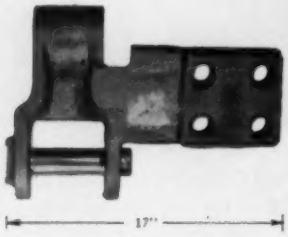

Conveyor link removed for inspection after equivalent of 3 years' single-shift operation. No perceptible wear has resulted in any area.

Heavy duty machine components take the beating of 10,000-lb. loads in stride to save operating and maintenance costs.

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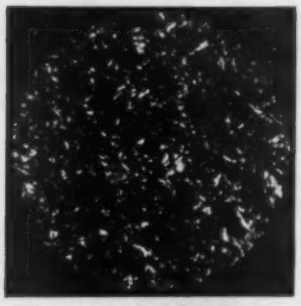
Wheelabrator steel shot® cleans faster because it's harder



Microstructure of Wheelabrator Steel Shot. Magnification is 500 diameters. 2% Nital etch.

A demonstration of WHEELABRATOR'S

VITAL VALUES

The harder the abrasive, the faster it cleans. And Wheelabrator Steel Shot is hard—6 to 10 Rockwell points harder than any other steel abrasive. In addition, it is heat treated to give maximum toughness and longest fatigue life consistent with its uniform high hardness. Thus, you receive the Vital Value of extra savings through reduced abrasive consumption, plus faster cleaning speed because of the higher hardness. Wheelabrator experience in pioneering airless blast cleaning progress always has meant greater savings for you. For the full story of the Vital Values and savings built into Wheelabrator steel abrasives, write for Bulletin 903-D.

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FOOTE MINERAL COMPANY *is the exclusive sales agent for Sherritt nickel and cobalt in the United States and Canada. For complete illustrated brochure with prices and delivery information, contact the Foote Mineral Company, 473S Eighteen West Chelten Building, Philadelphia 44, Pa.*

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For More Information Circle 587, Page 39

the really tough jobs are blown on FLEXIBLO®

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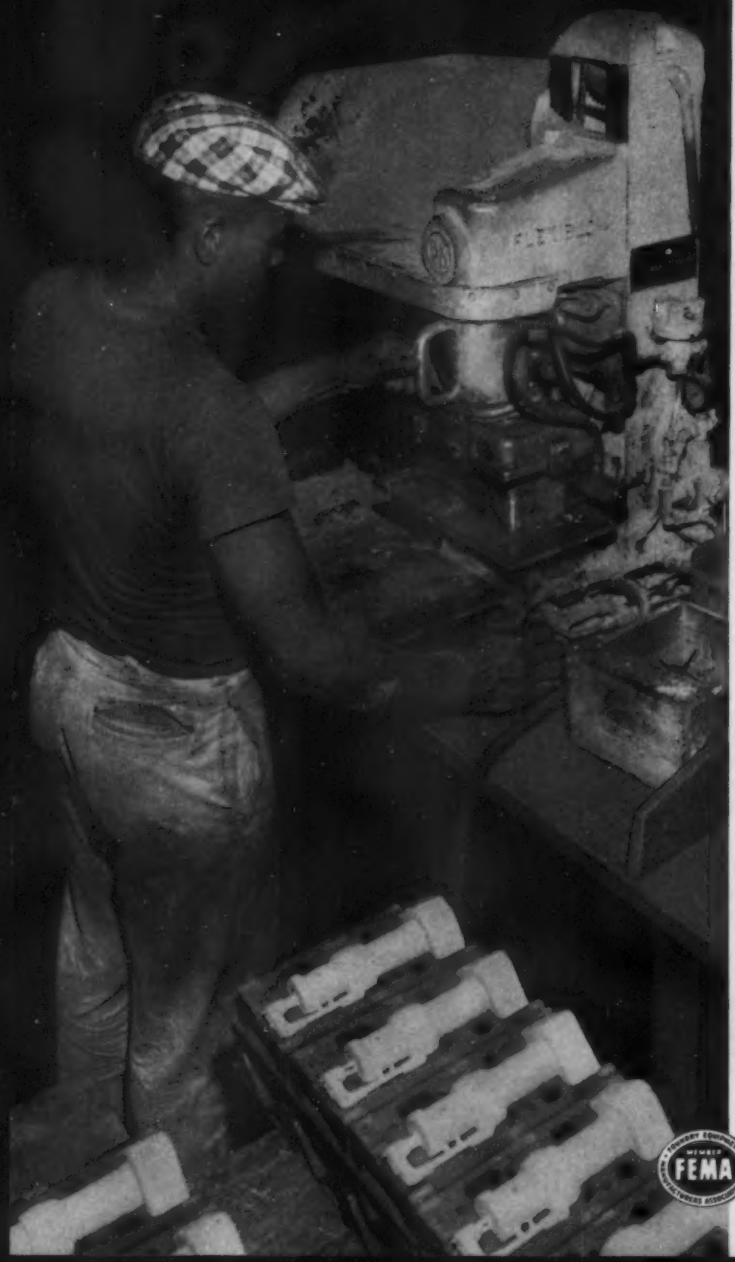


From B & P RESEARCH

The most intricate cores, previously made only by the most skilled bench core makers, are now made push-button fast on Beardsley & Piper's Flexiblo. Costly, time consuming bench coremaking has been eliminated in many foundries by Flexiblo's outstanding productive capacity and flexibility.

The Flexiblo is so flexible that core box changes are made in seconds. So versatile that even unvented, wooden core boxes are routinely handled, yet cores are blown harder, faster and with less core box wear than on any other blower. Piping or channeling of sand in magazines is eliminated as a result of the B&P specially engineered blow valve . . . and Flexiblos start producing the minute they arrive at your foundry. Core box modifications are rarely required—and skilled core makers are *never* required.

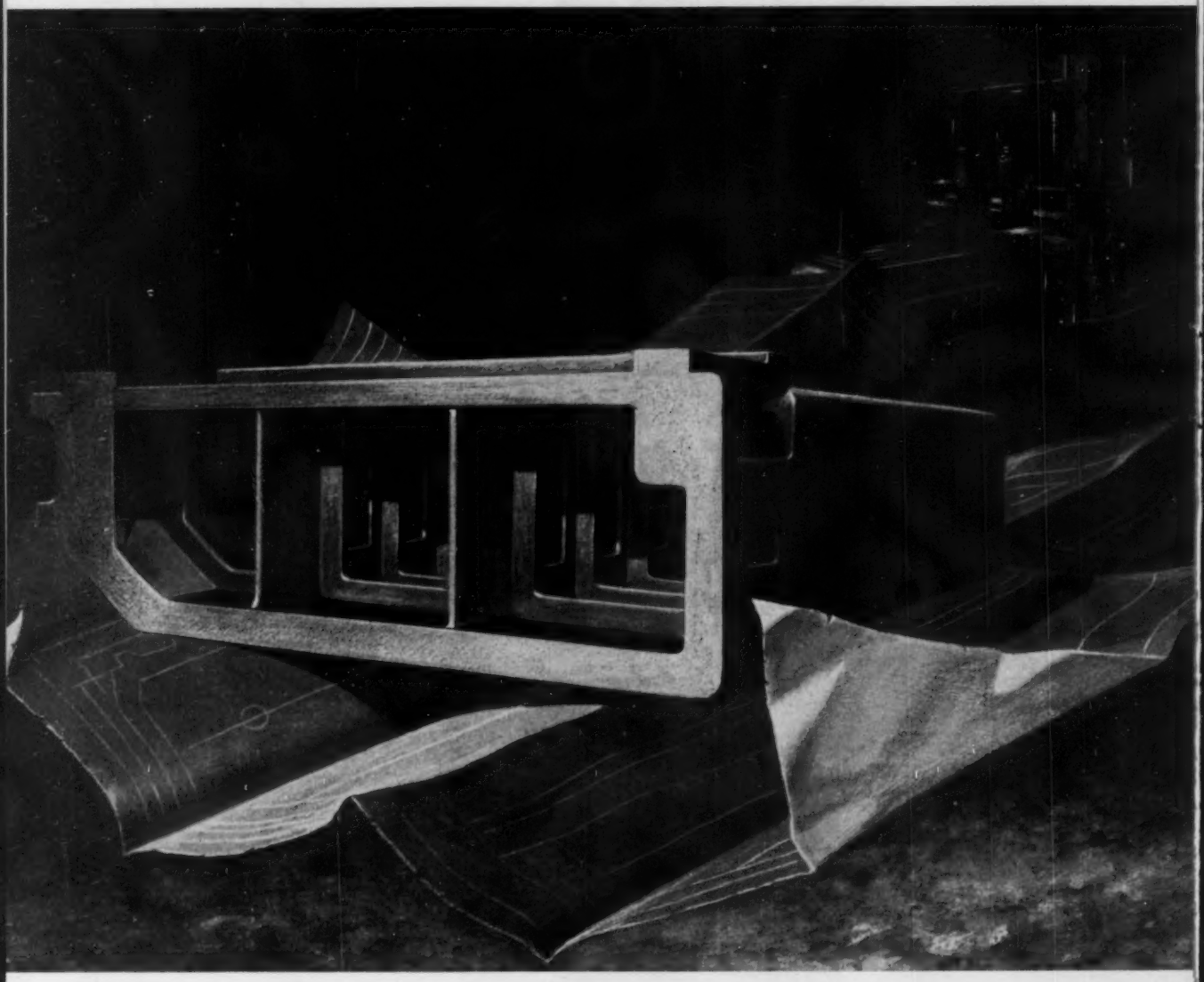
Flexiblos are available for cores ranging in size from the smallest to 500 lbs. and are the result of intensive research, development and proving by B&P engineers. The balanced, versatile design is ideal for either jobbing or production work, and offers every feature of proven value in the foundry field . . . greatest productive capacity . . . semi-automatic or fully-automatic control . . . proven safest operation . . . minimum maintenance . . . and the Flexiblo blows all types of sands. Foundrymen report that Flexiblos, because of savings realized through these features, pay for themselves in a matter of months.

Your Beardsley & Piper representative will be happy to survey your core room needs and make his recommendations. He is well equipped through training and experience to aid in your selection. His recommendation, backed by B&P research and engineering, is your assurance of lasting satisfaction.

BEARDSLEY & PIPER
Div. of Pettibone Mulliken Corp.
2424 N. Cicero Ave., Chicago 39, Ill.

For More Information Circle 588, Page 39

How the Foundry Industry Serves America . . . #7 of a Series



EVEN ON A SHORT RUN, IRON CASTINGS BEAT FABRICATING COSTS BY $2,984

Originally the right- and left-hand columns for this new heavy-duty planer were designed for weldments at a cost of $10,400 each. However, the blueprints indicated some difficult-to-weld elements. So, despite the fact that there was only a short run of two orders, the cost-saving possibilities of gray iron castings were thoroughly explored.

The cost of making sectional core boxes for both the molds and the cores came to $7,000. With the cooperation of the foundryman and pattern maker, they were made reversible to obtain either a right-hand or left-hand casting. The total production cost for two pairs of the 16,900-lb. gray iron castings, including patterns, came to only $17,816 vs. $20,800 for welded columns . . . a measurable savings of 14.3%.

This is just another example of how the intelligent use of versatile iron castings can solve many short run industrial design problems, and effect important fabricating economies at the same time.

For the production of structurally sound iron castings, Hanna Furnace provides foundries with all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorous, as well as HANNA-TITE® and Hanna Silvery.

Facts from files of Gray Iron Founders' Society, Inc.

HANNA
THE BEST KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION

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For More Information Circle 589, Page 39

READERS' COMMENT

Impressive Editorial

To THE EDITORS:

We here were very impressed with your editorial entitled "It's Your Gain," in FOUNDRY for September, 1960, and I thought you would like to know that we have taken the liberty of distributing cyclostyled copies of it to the secretaries of our national, local, and branch associations with, of course, full credit to your journal.

We are also proposing to print it in full in a forthcoming issue of our own monthly bulletin which is a confidential document distributed to our member firms—again, of course, with full acknowledgment of the source. I feel sure you will have no objection to this.

B. H. TRIPP
Press and Publication Officer
The Joint Iron Council
London S.W. 1, England

Why Special Specifications?

To THE EDITORS:

How many inquiries have foundries received in the last year calling for materials with unfamiliar specifications? How many phone calls have they made, checking material specifications, that could have been avoided?

The following example is by no means uncommon.

The X Company of Pennsylvania has received a substantial order for "a better mousetrap" which it has developed. The order is so substantial that a subcontract is necessary on the "trigger" mechanism. This mechanism contains several parts, one of which happens to be a gray iron casting. The blueprint furnished the subcontractor specifies that this casting is to be produced in "Gray Iron #AB 3.44."

Up to this point, all is well. The subcontractor's purchasing agent is given the blueprints and, seeing that they call for gray iron, sends inquiries to his foundries, in this case three reputable and modern outfits. Now the headaches begin.

The purchasing agent immediately receives three telephone calls, one from each foundry, informing him that they are happy to quote but would like further information on the properties of "Gray Iron #AB 3.44."

Gray iron has been called many things, they maintain, but none of them resembles this particular orientation of letters and numbers. The purchasing agent, lacking a degree in metallurgy, naturally is somewhat at a loss. He thought all gray irons were made to standard specifications and, seeing that this one had some impressive numbers to distinguish it, had given the material no further thought. He is forced to tell the foundries, "I'll call you back."

Several days and many phone calls later, the foundries have been apprised of the fact that this mysterious material is merely a relatively simple ASTM Class 40 gray iron for which, naturally, X Company has its own nomenclature.

Not every company writes its own specifications, but this problem is growing. There is no question that some companies need their own specifications where special alloys, heat treatments, and manufacturing problems are present. There is also the question of security, either of the government type or from the inroads of curious competitors. These problems sometimes are far smaller than those of clarification.

In too many cases, "special" specifications are written when a simple addition or alteration of any of the already written and familiar specifications would have sufficed.

We are constantly fighting the encroachment of "red tape" on our businesses and lives. This is one field where it is still possible to cut down this tendency toward complication. We must continue and expand this effort before every user of engineered products has drawn up a separate set of specifications with the resulting numerous, expensive headaches for their present and prospective suppliers.

ROBERT S. THOMPSON
President
H. P. Deuscher Co.
Hamilton, Ohio

In the interest of the American foundry industry, this ad (see opposite page) will also appear in

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IRON AGE
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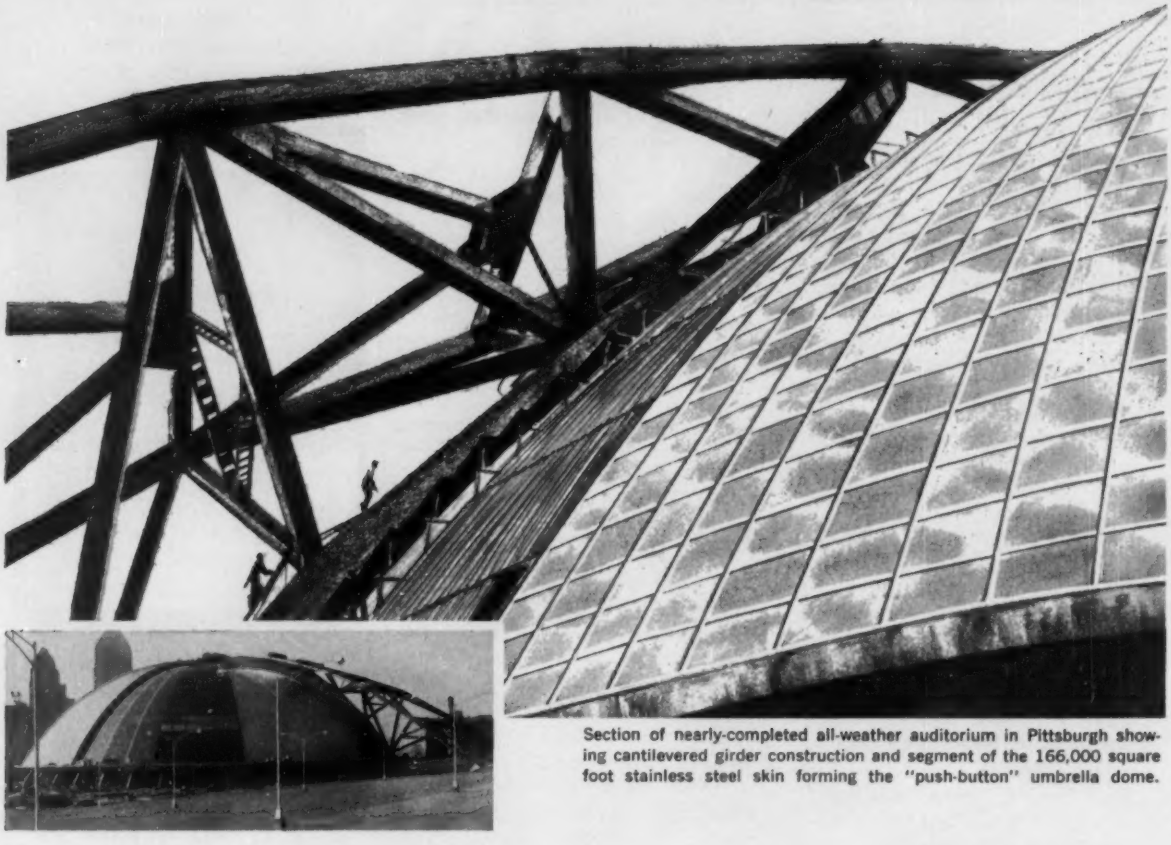
For More Information Circle 589, Page 39

when you're producing Electric Steels



Section of nearly-completed all-weather auditorium in Pittsburgh showing cantilevered girder construction and segment of the 166,000 square foot stainless steel skin forming the "push-button" umbrella dome.

GLC Electrodes will give you these extra values

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of **superior quality, plus** such extra values as...
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WHEREVER METALS ARE CAST... FOUNDRY

APRIL 1961

The Positive Approach

If you listened to complaints from all too many foundrymen and from a large number of salesmen of equipment, supplies, and materials, you probably would gain the impression that the foundry industry has gone to hell on a bandwagon.

This appraisal of the industry certainly is not true. A look at the 1960 statistics shows that although business has been off, production of 15 million tons last year compared favorably with the 15.8 million tons produced in 1959.

Furthermore, we do have reports indicating that numerous foundries are doing well and that some sections are experiencing an improvement in demand.

What is happening in the foundry industry is quite apparent. With business down, purchasing agents or other foundry executives tend to cry the blues to anyone who will listen, including salesmen for foundry equipment and supplies. These salesmen, being sympathetic souls, are ready to weep with their customers. Then the salesmen carry the bad news to other customers, and the weeping grows apace.

How a salesman intent on spreading the tidings of gloom can hope to sell his product is beyond comprehension. Surely, providing news of any bright factors in the situation and stressing faith in the future of the business will create a better climate for the movement of goods and services. We may need a reapplication of the old mid-twenties philosophy of Emile Coue that "Every day in every way I am getting better and better."

Foundrymen and vendors alike should remember that the condition of the foundry industry is no different from that confronting its principal competitors. There is nothing in this situation that cannot be helped greatly by improvement in the nation's economic well being. Experts see this improvement getting under way.

Furthermore, both groups must learn to do business under changed conditions. Until demand again exceeds capacity to produce, foundry customers will not carry heavy inventories of castings. Likewise, foundrymen will buy their materials and supplies almost as needed.

This industry needs men who believe in its future. Are you one of them?

Frank G. Steinebach

Publisher
Editorial Director

Casts Exhaust Port Valves on

Automated Shell Mold Line

Valves are produced in four-part, resin-bonded sand molds backed up with shot in flasks. Automatic core and mold machines are featured in production. Here's the story

By ROBERT H. HERRMANN
Associate Editor

● THE CASTING of high nickel-high chromium steel exhaust port valves in shell molds at Ford Motor Co.'s Dearborn Specialty Foundry is a highly automated operation. Valves are produced at the rate of 9600 an hour in a number of sizes for all the Ford engines.

Definning the gate core, unloading core and mold machines, mold assembly, and pouring are the only production operations involving hand labor. All other operations, including mold making, gate core and pouring cup production, shakeout, degating, sorting the exhaust port valves according to size, and transportation between work stations, are automatic.

Molding and Coremaking — Resin-bonded sand molds and pouring cups are made on a 15-station, continuously-rotating dump box machine. Thirteen, 16-valve patterns and two, nine-pouring cup patterns are held by pattern carriers mounted on rods extending from the periphery of the turntable. The rods are rotated by cam mechanisms inside the turntable housing.

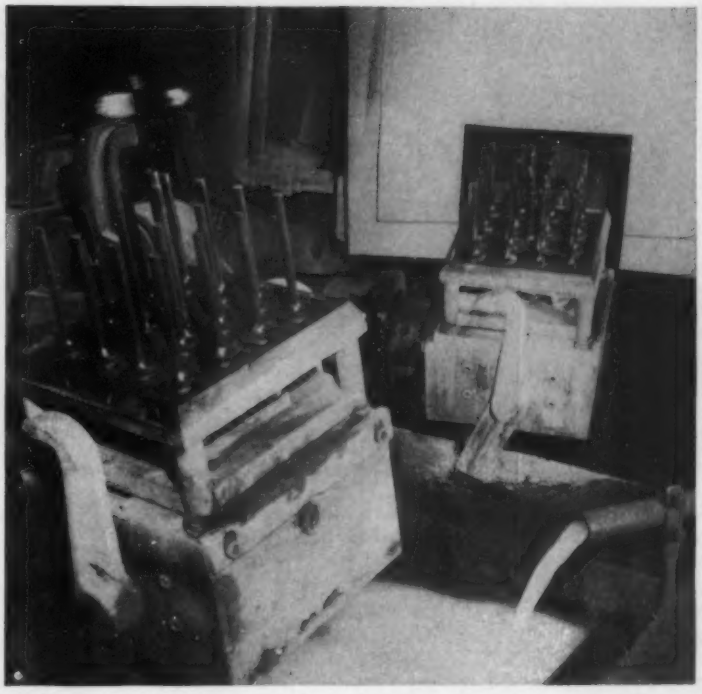
The rods are rotated 180 degrees at the first station to dip the patterns in a tank of water containing ½ per cent silicone. The patterns are carried through a gas-fired tunnel oven to bring them to 450-500° F. As they emerge from the oven, an individual dump box for each pattern is raised to the pattern by an arm extending from the periphery of the turntable at its lower edge. Hooks on the pattern carrier engage trunnions on the box. The assembly is inverted for 6-7 seconds to make a 3/16-in.-thick shell.

The pattern and dump box roll back and a carrier arm raises to engage the box and lower it. Coated patterns are carried through a gas-fired curing oven. The dump boxes, riding on the lower set of arms, pass under an automatic filler. This consists of a vibrating feeder to supply coated sand to a small box. Rate of feed provides the amount of sand that forms the shell mold. The box has a sliding bottom moved by an air cylinder controlled by a limit switch. The measured amount of sand is dropped into each dump box as it passes underneath.

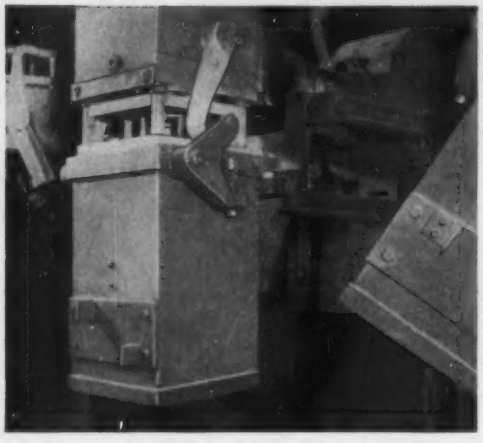
As the upper set of rods carries the patterns with the cured molds from the oven, stripper pins raise the molds about 2½ in. A worker removes the molds and sets them on shelves of a monorail cooling conveyor. The mold-making machine completes a cycle in about 80 seconds.

A twelve-station, gate core-making machine operates in a manner similar to that of the mold making machine. One difference is that no dump boxes are used. The pattern, operated at 375-425° F, passes under a vibrating feeder to receive coated sand. Excess sand simply falls off the edges of the pattern. The ⅛ in. thickness of this wafer-

Valve pattern in foreground will be inverted and dipped into tank of silicone wash, then returned to original position for movement through tunnel oven, background



Patterns emerging from oven are inverted again and a dump box is raised and clamped to the pattern. It is inverted to invest the pattern with resin-coated sand

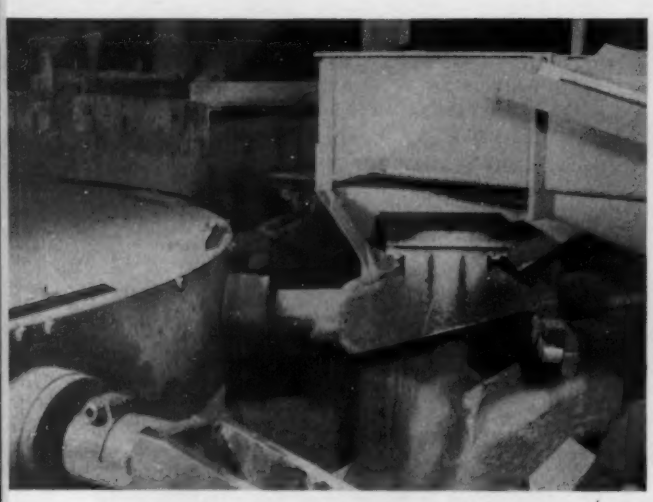


Operator removes cured valve mold from pattern on fixture at the end of one of 15 rotating arms on the molding machine turntable. Sixteen exhaust port valves are cast in each mold

like gate core is controlled by a strike-off plate just past the vibrating feeder station.

At completion of the 70-second machine cycle the rods carrying the patterns rotate to drop the cured cores on a table. A worker defins the gate openings by placing the core on appropriately positioned pins on a vibrating plate.

Sand Preparation — The coated sand used in the two rotary machines is prepared as follows: 500 lb of AFS 110 sand is heated to 340° F in a rotary gas-fired kiln and discharged into a muller. Novalak flake resin, 23 lb, is added, and the mixture is mulled for 3 minutes. The resin-coated sand then is dumped into a skip bucket and next into a second muller where 3½ lb of hexamethylenetetramine mixed with 1 gal water is added. The resulting mass is mulled until the lumps have been broken down. Then 10 oz of powdered wax is added and mulling continued for 1 minute.



Patterns on turntable arms are invested by stream of coated sand to make ⅛-in.-thick gate cores

Worker punches hole in top of sprue, puts gate core on valve mold, and sets assembly on runner core

The finished sand is discharged to a vibrating screen. Screened sand is conveyed to a hopper over each of the rotary machines.

A different sand mix is prepared for the runner cores. It consists of 250 lb sharp sand, 3 lb powdered phenolic resin, and 2 lb cereal. This mixture is mulled 1½ minutes. Then 6 pt water is added and mulling continued for 1 minute. One pint release agent consisting of one part sand conditioner and two parts kerosene is added and the mixture mulled for 30 seconds before discharging to a bucket elevator for delivery to a hopper over two core blowing machines.

Runner cores are blown in double-cavity boxes and are set off on asbestos-cement boards for conveying through a dielectric oven. Cured runner cores are set in groups of five, evenly spaced in a row with the help of a jig, on a metal-topped car of a conveyor. They pass under air jets for blowing loose sand grains out of the runner system. The car conveyor travels under and parallel to the monorail conveyor carrying molds, gate cores, and pouring cups.

Mold Assembly—Workers at a bench along the conveyors take a gate core off a monorail carrier, poke a hole in the top of the down sprue with a rod, and place the gate core on a valve mold also removed from the monorail carrier. This assembly is placed on a runner core on the car conveyor. Then a worker slips a pouring cup over the end of the sprue.

The mold conveyor moves under an automatic flask setter which lowers a steel flask to each car as the conveyor moves through. Each flask surrounds a group of five molds.

Flasks are filled with shot at the next station. A shuttling, funnel device is set on the flask by an air cylinder and rides with the flask for a short distance. The device has an inverted V channel in the center which covers the pouring cups on the five molds in the flask. Shot from an overhead hopper and vibrating feeder spills down a two-channel chute which directs the shot to each side of the sprue cover to pack the molds. When the flow of shot stops, the funnel device is lifted and shuttled back to the succeeding flask.

The conveyor continues around to the pouring hood where two men pour high nickel-chromium steel at 2950° F from hand-operated monorail-suspended ladles. The alloy is melted in two, 6-ton, top charge, swing roof, electric arc furnaces. Heats are tapped to 1500-lb ladles moved by monorail carrier to either of two smaller arc furnaces having holding capacities of 5500 lb. Metal is tapped at 2980-2990° F to pouring ladles so that it will enter the molds at not under 2950°

A pouring cup is placed on end of sprue. Mirror behind the conveyor assists the worker in inspecting mold assemblies

Worker defins openings in gate cores by placing the cores on appropriately positioned pins of a vibrating plate

F. Alloy percentage analysis is: 15.00-16.00 Cr, 13.00-16.00 Ni, 2.50-3.50 Si, 0.85-1.05 C, 0.30-0.60 Mn, balance Fe.

Automatic Shakeout — Poured molds travel through a cooling tunnel for 15 minutes. When they emerge, a pneumatic ram pushes flasks off the cars to a vibrating perforated plate. Shot and sand fall through, the flask is lifted and moved automatically to the flask-setting device, and the cast clusters of 16 valves move off the end of the plate in upright position.

They are funneled into single file at the end of the vibrating plate. The sprues enter a slot in a vibrating conveyor which carries the cluster suspended by the pouring basin, shaking off adhering mold material along the way. The cast valve cluster is discharged on a vibrating table which feeds one cluster at a time to a stop where U-shaped carriers on a chain conveyor pick up individual assemblies by the sprues.

The 1152-ft-long chain conveyor carries the cast assemblies at ceiling level and provides a cooling time of 51 minutes. The conveyor brings the clusters down to a mezzanine where they are carried through channels to hold them straight while two spinning wheels with hinged weights knock off the valves. They fall to an inclined belt conveyor.

The chain conveyor continues on to a point where the hangers are tilted by a stop to let gating system metal fall off to a box for trucking to the melting department.

Cast valves are dumped from the belt conveyor to a rotary, continuous-flow, blast cleaning machine. It discharges cleaned valves out the other end to an inclined, cleated belt which feeds a chute for dumping the valves on the turntable of an automatic valve sorting machine. The machine has the capacity to sort 9800 valves an hour. Sorting is by height of valve, and the different units are ejected on different chutes to boxes for trucking to the machine shop.

Quality Control—Metal samples for chemical analysis are taken from the large furnaces immediately after melt-down. After the metal is transferred to the smaller furnaces, chemical tests are run every half hour.

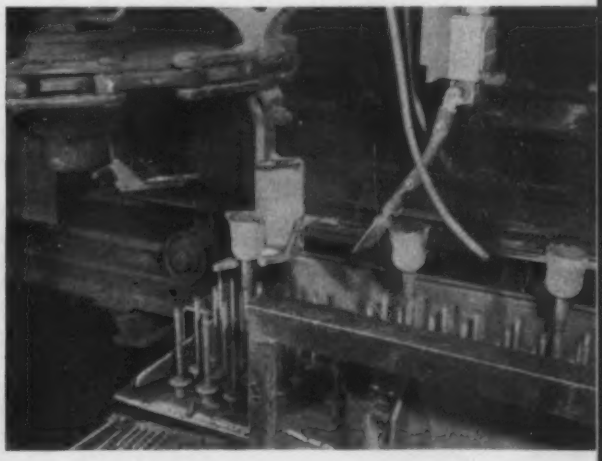
Three 16-valve clusters, one poured from the first, middle, and last metal of every small furnace heat, are taken off the production line for testing. One valve from each cluster is cut in half lengthwise. One half is etched and examined visually for microshrinkage. None is tolerated. The other valves are x-rayed. If a valve fails either inspection, the entire production from the heat involved is scrapped.

Dimensional and warpage checks are made on valves pulled from production every hour.

● For an extra copy of this article, until supply is exhausted, use card on Page 39

Worker pours high nickel-chromium steel into shot-backed molds as they pass under exhaust hood

U-shaped carrier on a chain conveyor picks casting cluster off table for cooling and despruing



Chrysler Diecast Block

Reduces Engine Weight

Production details on the Chrysler Corp. diecast aluminum engine block are presented here. This block, which is the second to be diecast in the United States, weighs only 64 lb after machining

By E. G. MOELLER, W. L. WEERTMAN, and H. E. ERIKSEN
Chrysler Corp.
Detroit

● REDUCED engine weight with maintained levels of durability, performance, and cost—that's Chrysler Corp.'s objective for its new 225-cu in. diecast aluminum engine, now in limited production for the 1961 Dodge Lancer. The weight reduction has been achieved primarily by using the diecast cylinder block, which weighs 76 lb less than its counterpart in cast iron, and diecast aluminum oil and water pumps, which save another 5 lb.

In other respects, this engine incorporates components of the 225-cu in. engine which was introduced as a completely new engine in 1960 Dodge Dart cars. Carryover parts include the gray iron cylinder head, used as the best solution to durability and manufacturing cost considerations. Also, because of lower manufacturing cost, a gray iron intake manifold is employed in preference to the semipermanent mold aluminum design utilized on the 1960 model. Other major gray iron components include cylinder sleeves and upper and lower main bearing caps.

The engine (Fig. 1) has six cylinders in line, with a 3.40-in.-diam cylinder bore and a 4.12-in. stroke. Compression ratio is 8.2:1, which allows the use of regular grade fuel. The engine is tilted 30 degrees to the right for most efficient use of engine compartment space. It incorporates pushrod-operated, overhead, in-line valves in an open, wedge-shaped combustion chamber.

Diecasting Method—In designing a light-weight aluminum cylinder block, Chrysler engineers gave the diecasting method first consideration because it provides the best possibilities for lowest weight, lowest over-all cost, and most consistent production quality.

The lowest weight is possible because wall sections can be tailored to meet the strength requirements based on a fatigue strength of 10,000 psi. Where wall sections do not carry appreciable loads, thinner sections can be cast by the diecasting process than by other means. Engine design must be carefully planned, however, so that with a reasonable number of slides in the die, the desired shape can be produced with a minimum of unnecessary and low stressed metal.

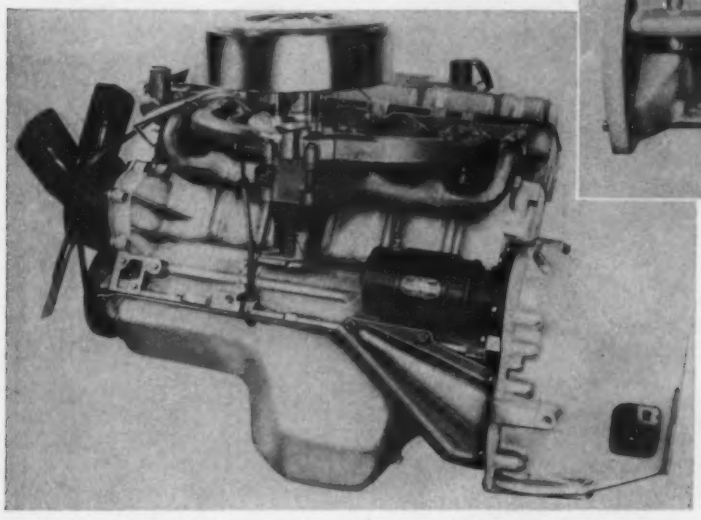
The lowest over-all cost of an aluminum block is the result of a combined lower cost of tooling, casting, and machining. More details will be given on these factors in a discussion of production considerations.

Production quality generally is considered to be superior and more consistent in diecastings because the process is less likely to be affected by human factors.

On the basis of our background data, it was decided to use gray iron cylinder sleeves in the block. A comparison of the use of replaceable wet liners and necessary coolant seals as compared with that of liners cast integrally with the block favored the latter for high production handling, quality control, and minimum cost. Two-piece gray iron upper and lower main bearing caps fastened to the bulkhead of the block with conventional main bearing screws, are used to simplify the crank chamber die. The camshaft journals run directly on the aluminum block material.

Cylinder Block — The cylinder block is cast around the cylinder liners, which are supported on mandrels on the bottom die (Fig. 4).

Fig. 1—View of left side of the engine, including clutch housing, starter, intake and exhaust manifold assembly, and other details



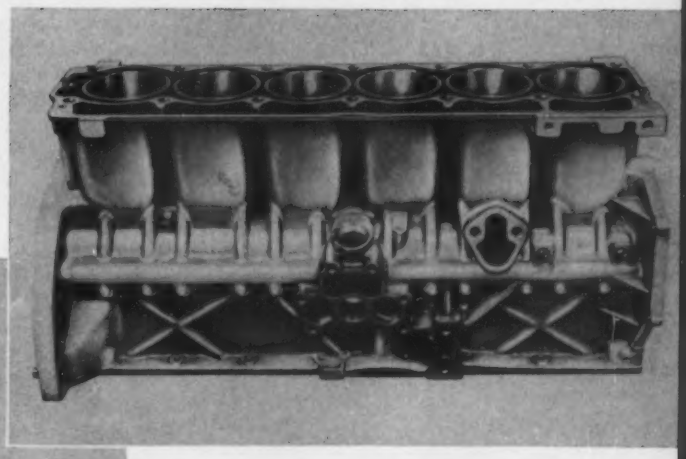


Fig. 2—Weight of the aluminum diecast block, seen here from the right side, is only 64 lb

Each iron cylinder liner is 0.10 in. thick, and aluminum around it is 0.11 in. thick at the top of the bore, where the aluminum is thinnest due to the 0.50 degree draft of the water jacket core. The combined thickness of iron and aluminum in the cylinder bore is 0.21 in. and the engine is designed on a 3.98-in. bore center spacing. This, in conjunction with 3.40-in. diam cylinder bore, provides a minimum water jacket thickness of 0.16 in. between cylinder bores.

When the aluminum is cast around the iron cylinder sleeves, residual tensile stresses are set up in the aluminum by differential contraction of the two metals. To reduce this to the acceptable range of 10,000 psi, it is desirable to preheat the liners to approximately 600° F prior to making the casting, as frequently is done with composite castings.

The right side of the block is illustrated in Fig. 2, which shows how the tappet chamber wall is cored into the water jacket wall at the base of the cylinder head bolt bosses. The main oil gallery of the engine runs longitudinally along the block. The oil pump, distributor, and fuel pump are mounted on this side of the block on the bosses indicated. The fully machined cylinder block, as shown here, weighs 64 lb.

Other Diecastings—A single diecast part forms both the oil pump body and filter base. The major oil passages in the pump are used in the as-cast condition. This step is made possible because of the clean and accurately formed diecast surfaces. The same is true in the cylinder block, where a diecast oil gallery runs the full length of the block.

The body of the water pump is an aluminum diecasting incorporating a support boss for the impeller shaft assembly and an integral inlet hose nipple and two smaller nipples for the attachment of the permanent bypass and heater return hoses. It is an open-type casting backed by a steel plate 0.060 in. thick.

To prevent corrosion of the surfaces in contact with stagnant coolant, such as the water pump inlet and outlet in contact with radiator or heater hoses, these surfaces are coated with a corrosion-resistant paint. General corrosion of aluminum cylinder blocks and other aluminum components in the engine cooling system is not expected to be any more severe than corrosion of iron and steel components.

Die Design—The casting die is designed with the cylinder axis in the horizontal plane, as illustrated in Fig. 3. The crankcase core and the six mandrels which support the cylinder sleeves during casting are mounted in the stationary part of the die, shown in Fig. 4. The four sides of the block plus the cored-out top surface are formed by die pieces mounted in the movable or ejector half of the die. To allow the ejector half of the die to function, the portions of the die forming the four sides are mounted on slides (Fig. 5) to provide means for retraction.

To core the holes which are at angles to the direction of the slide movements and die opening, hydraulic cylinders are used. Hydraulic cylinders also are required to core the oil gallery holes because of the 13-in. core pull. The die assembly weighs approximately 44,-

000 lb and measures 83 in. wide, 60 in. high, and 49 in. thick.

Diecasting Machine—A 2000-ton diecasting machine provides the locking force to withstand a metal pressure of 8000 psi. To maintain these pressures in the die, fill the complete cavity, and achieve a rapid machine cycle, 11 accumulator bottles and 5-in. hydraulic lines are used. The die assembly is shown mounted on the machine in Fig. 4 and 5.

Inasmuch as an engine cylinder block is a highly stressed part, good metal quality is required, particularly to avoid porosity and cold-shuts, which are common problems in aluminum castings. This need involved development of the proper metal casting temperature, die temperature control, metal overflow points, gating, and other techniques.

The development program took into account requirements for dimensional control which are affected by the die operating temperature, as well as dimensional variables. One of the most difficult dimensional tolerances to maintain is to keep cylinder bore centers within ±0.015 in. of their specified locations.

To provide good castability of the cylinder block, it was decided to use SAE No. 303 aluminum diecasting alloy containing 3 to 4.5 per cent copper and 10.5 to 12 per cent silicon.

The development program for the diecast aluminum block was the most intensive and thorough ever conducted by Chrysler Corp. on a new engine. The design, even though based on well-proved background information, was evaluated and developed intensively over a long period. This involved work in all phases of stress analysis, both static and dynamic, and engine testing on a wide variety of test schedules both in vehicles and on laboratory endurance dynamometers.

Several detail changes were made during the development period, but generally the extensive test program served to provide confidence that the engine design made no compromise in durability.

On completion of this development program, we are convinced that this engine with a diecast aluminum cylinder block has satisfactory durability and is a step toward lighter and more efficient automotive power plants. The use of diecast aluminum parts also seems to be desirable from the standpoint of improving manufacturing efficiency.

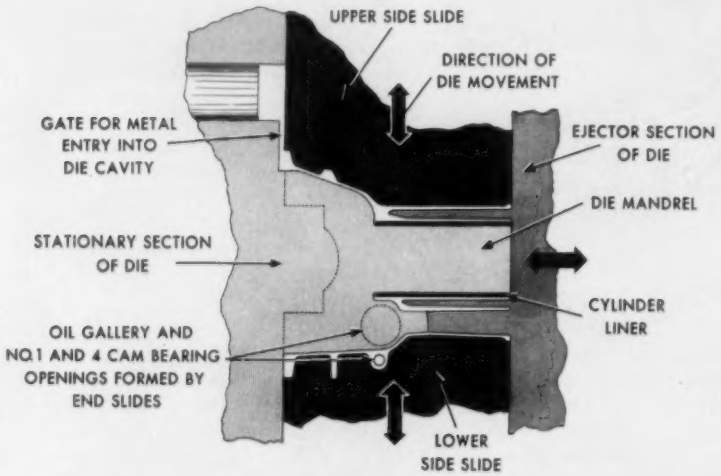

UPPER SIDE SLIDE
DIRECTION OF DIE MOVEMENT
GATE FOR METAL ENTRY INTO DIE CAVITY
EJECTOR SECTION OF DIE
DIE MANDREL
STATIONARY SECTION OF DIE
CYLINDER LINER
OIL GALLERY AND NO.1 AND 4 CAM BEARING OPENINGS FORMED BY END SLIDES
LOWER SIDE SLIDE

Fig. 3—Die is designed with the cylinder axis in the horizontal plane as shown here. Crankcase core, mandrels are on die's stationary half

Editor's Note: This article is condensed from a paper presented by the authors at the 1961 Society of Automotive Engineers International Congress.

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Fig. 4—View of stationary half shows three crankcase bays and six mandrels required for the block

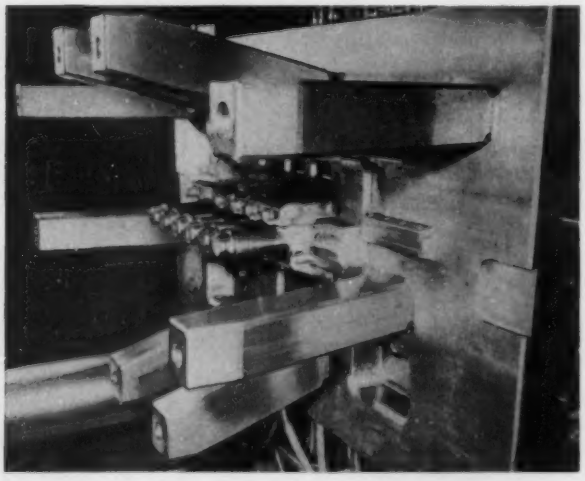
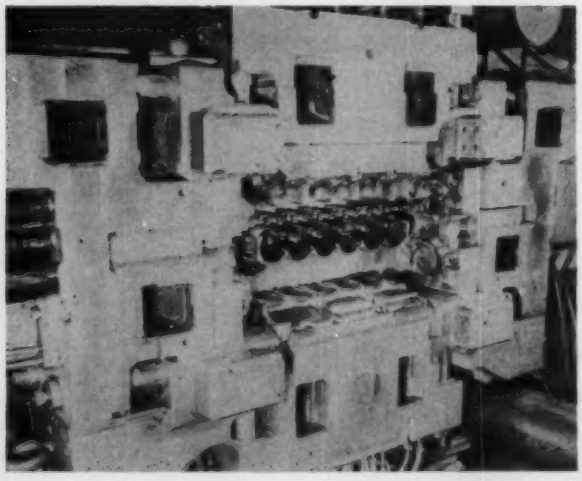


Fig. 5—Ejector half of die carries the side slides required to core out the ends and side of the block



Excess Metal Loss: *Nonproductive Metal:* *Rejected Castings:*

How to Save Brass Foundry Metal

Brass foundries can cut operating costs by reducing metal losses. The author lists several areas in which metal losses should be checked

By HARRY ST. JOHN
Foundry Consultant

● SELDOM in the past has foundry management been faced by so many problems as now present themselves. For some years advances in technology have promoted radical changes in foundry practices and policies. Now the need for these changes seems to be increasing rather than diminishing.

In common with all American industry, foundries have experienced a tremendous increase in labor costs per man-hour. It is evident that increased labor cost has been responsible for many developments primarily designed to save labor.

Because of increasing costs and more or less rapid adoption of improvements in foundry technology, competition has become increasingly severe. New materials and new methods have brought into the marketplace products designed to replace castings. Against this competition castings have lost much ground, some of it unavoidable, but much of it due to failure of foundries to make the most of their opportunities.

Taking advantage of opportunities and fighting competition does not always require new equipment, new production methods, or even a monetary outlay of any proportion. There are some things that almost any foundry can do, without heavy investment, to decrease its material and labor costs and thus increase its competitive advantage.

Keep Records—Very few brass foundries keep adequate records of their use of brass and bronze alloys. These alloys are costly and should be watched as closely as a bank watches pennies. Metal waste can be classified under three main headings:

Excess Metal Loss: This includes metal oxidized, volatilized, or otherwise dissipated in such a way that it is gone beyond the possibility of recovery.

Nonproductive Metal: This is metal melted and poured but which is not part of the castings sold to the customer. Obviously a certain proportion of nonproductive metal is unavoidable, but, in excess, it often is a serious element of cost.

Rejected Castings: These are defective castings and could be classified as nonproductive metal. They are classified separately, however, because they involve such a serious waste of labor, productive as well as nonproductive.

Metal waste can be controlled only if the weight of metal used, at various stages of its processing, is accurately known. To accomplish this the following information must be recorded:

1. The weight of metal charged to the melting furnaces, daily or weekly.

2. The gross weight of castings, good and bad, after they have been cleaned and ground, ready for machining. This is the gross casting yield.

3. The weight of metal pigged for any reason, daily or weekly.

4. The weight of grindings removed from castings during preparation for machining. This need not be daily or even weekly but over a convenient period so that a reliable average can be established.

5. The weight of castings delivered to the machine shop and the weight of defective castings returned to the furnaces for melting, daily or weekly.

6. The weight of machine turnings returned by the machine shop. This weight may be taken at intervals when turnings are received.

7. The weight of defective castings returned by the machine shop, weighed when received.

8. The approximate weight of acceptable castings delivered to the customer after these have been machined. This is the net casting yield. It can be calculated from time to time and may be taken as a measure of the foundry's ultimate efficiency in the handling of its metal.

Know Total Melt—The accurate weight of metal melted should be known since it is the most reliable basis for calculating the efficiency of all foundry operations. Furnace charges will include the following:

1. Purchased metal such as composition ingot, brass and bronze scrap from outside sources, copper, tin, lead, zinc, and, sometimes, nickel. In most foundries purchased metal will include only compositon ingot and such additions as may be required to maintain the desired composition.

2. Gates and sprues. If not cleaned by blasting, these will carry a certain amount of adhering molding sand. This should be estimated and subtracted from the total weight.

3. Castings rejected because of defects.

4. Pigged metal and metal recov-

ered from the skimmings and spill.

5. Machine shop turnings. Grindings are not included because so little recovery is possible that their use is unprofitable.

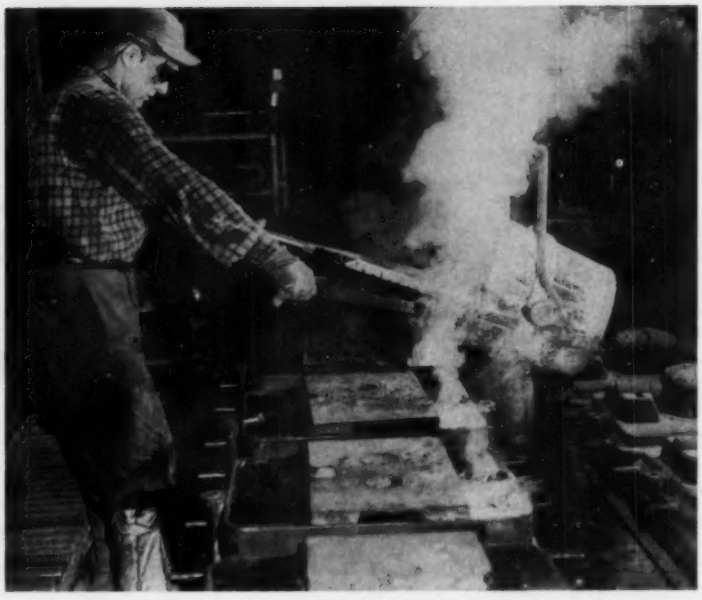
The purchased metal listed under 1 must be sufficient to equal the weight of metal ultimately accepted by the customer plus the various items of net metal loss. As a rule, if purchased metal is a high proportion of the total melt, the foundry can be assumed to be doing a good job in its economical use of metal. To accomplish this, items 2, 3, 4, and 5 must be reduced to the lowest possible point.

The one bad element in item 1 is the quantity of metal required to replace net metal losses. These occur at various points in the foundry operation. In the figures which follow, the values ascribed to different forms of metal loss should be considered goals which the foundry should strive to reach. In each case the figures are based on results which have been observed in one or more foundries. Few foundries reach all of these goals but they are all attainable.

Melting Loss—Every foundryman thinks about his melting loss and sometimes thinks of it as the sole net loss. Unfortunately, accurate measurement of the true melting loss is difficult and seldom is attempted. To assume that all of the loss is zinc and can be measured by the amount of zinc which has to be added to maintain the composition of the alloy is incorrect.

Accountants sometimes estimate the loss at the end of the year by calculating the weight of metal which can not otherwise be accounted for. This actually includes many variables and results in a misleading evaluation. It is evident that the proportion of nonproductive metal has a bearing on this calculation since it suffers a loss each time it is melted.

The metal lost beyond recovery in fuel-fired melting furnaces should not exceed 3 per cent; losses of less than 2 per cent have been observed. In electric furnaces, losses can be held to 0.5 per cent with the red alloys and 1.0 per cent with yellow metal. If higher losses are experienced something is wrong with the furnace or with its operation. For example, excessive superheating of the metal in the furnace may increase the loss. In extreme cases the melting loss may be as high as 8 per cent.



Weight of pigged metal can be held to 2 per cent maximum if the proper pot is used. Pouring loss should be held to 0.5 per cent

The loss of metal during pouring into the molds is appreciable and usually will run about 0.5 per cent with little variation from one foundry to another. The loss of metal during blasting should be about 0.1 per cent but often is as high as 0.2 per cent.

Another element of loss frequently overlooked is the metal thrown away with discarded molding sand. The loss may amount to 0.2 or 0.3 per cent and can be avoided if good reclamation methods are employed.

Inevitable Loss—Metal removed by grinding wheels may as well be considered a net loss since the grindings have little value. If the cutoff operation is well planned, flashes and core caps avoided, the weight of grindings should not exceed 1.0 per cent of the total melt; it may run as high as 4.0 per cent if care is not taken. With castings whose design and volume of production permit the use of die trimming in place of grinding, the grinding loss may be eliminated entirely and much labor saved.

When all loss items are totaled, it is evident that some foundries may be handicapped by a net metal loss as high as 12 or 13 per cent of the total melt. That loss could be reduced to 5 per cent or even 2 per cent, depending upon the type of melting furnaces employed.

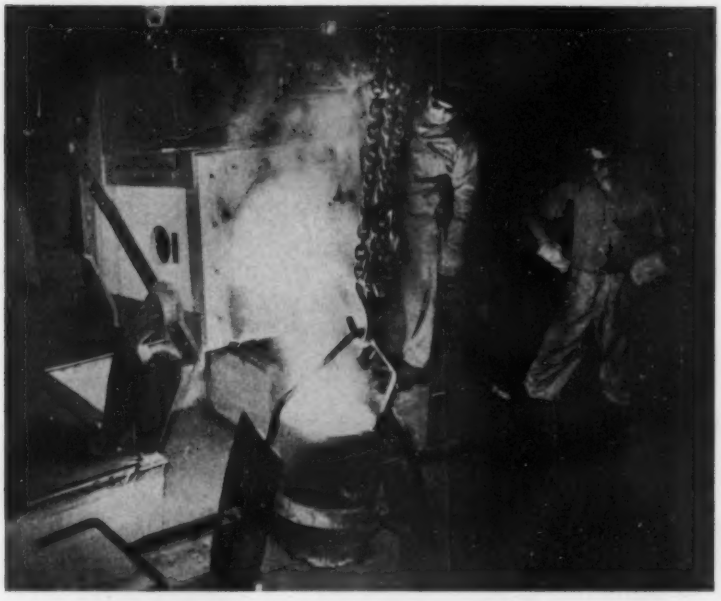
The influence of nonproductive metal on foundry costs hardly can be over-emphasized. To waste materials and labor on metal which has to be remelted over and over when it should be sold as castings is an obvious extravagance. Again, the figures which follow are a comparison of good practice with inferior practice too often encountered.

Watch Gating Practice—It is a natural tendency for foundry management to overcrowd the pattern plate with too many castings, while the man who has to make the castings tries to play safe by using unnecessarily large gates, sprues, and risers. True economy must avoid both extremes.

Castings vary so much in size and shape that no general rule can be stated. As a rough estimate it is close to the mark to say that some foundries devote as much as 40 per cent of the total melt to sprues, gates, and risers when 30 per cent would be sufficient. It must be admitted that these figures are subject to wide variations.

Waste of metal by spilling and careless skimming can amount to 2 per cent of the total melt; it should not exceed 1 per cent.

No matter how careful one may be, crucibles or ladles usually con-



Metal lost beyond recovery in melting furnaces should not exceed 3 per cent and sometimes can be as little as 0.5 per cent

tain cold metal which must be pigged after molds are poured. If the size of the pouring vessel is adjusted to the number of molds which can be poured, the weight of pigs can be reduced to a minimum.

If too large a pot is used, one of two things will happen. Either too many molds will be poured, some with cold metal, resulting in a large number of scrap castings, or a considerable weight of cold metal will be pigged. If the pot is too small, time will be wasted in refilling it. The weight of pigged metal can be kept to a maximum of 2 per cent of the total melt as compared with a not too uncommon 5 per cent.

Reduce Scrap—The reduction of defective casting losses is too large a subject to be dealt with in detail here. A statistical approach to the problem is recommended. A reasonable goal is 2.5 per cent of the total melt, divided about evenly between rough casting scrap and castings rejected after machining. A total of 6 per cent is not uncommon but is much too high.

One of the commonest excessive uses of nonproductive metal has to do with the weight of metal removed during machining. On the average this should not exceed 10 per cent of the good rough casting weight; sometimes it runs as high as 20 per cent. A foundry with a good performance up to this point may produce 60 per cent of the total melt in the form of good castings. If machine turnings amount to only 10 per cent of the good casting weight this foundry will show better than 50 per cent of its total melt as good finished castings.

However, if the machine turnings are 20 per cent of the good casting weight the foundry will lose much of the advantage it has gained by its good foundry performance. A foundry with a record of only 40 per cent good castings will lose heavily if it has 20 per cent machine turnings, but its loss will be a smaller percentage of its total melt.

The reduction of machine turnings to a minimum requires the united effort of the casting designer, the foundry, and the machine shop. The most favorable climate for this is the captive foundry where all three departments are under the same roof. The designer should specify the least possible machine finish. The foundry must produce as nearly as possible perfectly-dimensioned castings, free from surface blemishes. The machine shop, in its turn, must use chucks and other fixtures which are in nearly perfect condition. The care required to maintain these conditions will be repaid amply.

An Example—Compare two theoretical foundries. One ranks high in good practice; the other falls far short. If the comparison is based on the total weight of metal melted we find that one produces castings which comprise more than 50 per cent of its total melt, while the other produces below 30 per cent. Of this difference the most serious per-pound cost is the net loss of metal which can be as low as 2.5 lb or as high as 12 lb out of every 100 lb melted.

Almost equally serious and more easily controlled is the excessive use of nonproductive metal which results in a waste of labor and a duplication of losses. In most brass foundries nonproductive metal need not be more than 45 per cent of the total melt, but in some instances it may be as high as 60 per cent. When everything is considered, the better foundry can produce saleable castings about one-third cheaper than its less efficient competitor.

The objection may be raised that no foundry is quite as bad in all respects as the example taken would indicate, while very few foundries achieve all of the best results described. It is true, of course, that most foundry performances are between the two cited in the example.

In the writer's opinion, however, many a brass foundry could reduce its net costs 20 per cent by paying strict attention to its metal losses and excessive use of nonproductive metal, while better foundries might save at least 10 per cent. This saving would not involve the purchase of expensive equipment or adventures in the field of new methods which have an uncertain future. A foundry with limited financial means can postpone its decision in these matters and still remain competitive if it makes most economical use of the equipment it already has.

What To Do — To accomplish this, what must the foundry do? First of all it must keep records. Precise information is needed before intelligent steps can be taken to eliminate unnecessary losses. Data must be accumulated for at least six months, after which these data can be compared with what may be termed "best possible performance." The places where improvements are needed will become evident.

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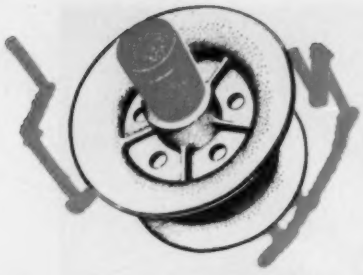

GATING and RISERING

Investment Castings

In this article on gating and risering investment castings, the author discusses nomenclature, pattern setups, and flask molding. He also points out how ferrous and nonferrous practices differ

By HYMAN ROSENTHAL
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● GATING and risering of investment castings has received little specific attention in the technical literature. As an industrial process, investment casting is relatively new, and the practices of the industry still are not fully documented. There also is the fact that investment casting is not a single, well-defined process, but a group of processes. Aside from variations in mold-making methods, the pouring of the castings encompasses a wide range of techniques.

Naturally, gating practices will differ for investment molds made in flasks and for shell investment molds. Gating practices also will vary according to whether the molds are cast by gravity, suction, pressure, centrifuging, vacuum chamber, or Durville-type pour.

Gating and risering can not be separated from the economics of the investment casting process. The number of gates, runners, and sprues in a gating system and the number of castings produced in one mold influence cost. In general, the simpler the gating system and the more castings produced in one mold the lower the cost of individual castings. This is true, of course, only if technically correct principles of gating and molding to produce sound, dimensionally correct castings are employed.

The gating system for investment castings is formed in the mold by expendable material similar to that used in patterns for the parts being cast. Gating system material and casting patterns are assembled into a structure called a pattern setup or cluster which must be strong enough to withstand deformation or breakage during the mold making.

Gating Nomenclature—Fig. 1 is a cross-sectional representation of a pattern setup. The expendable patterns and gating components may be of wax, plastic, or frozen mercury. The first two materials are used most widely. Pattern setup components include a sprue or sprues which may be tubular or rectangular with parallel or tapered sides. The sprue is attached to a pouring basin former, which may or

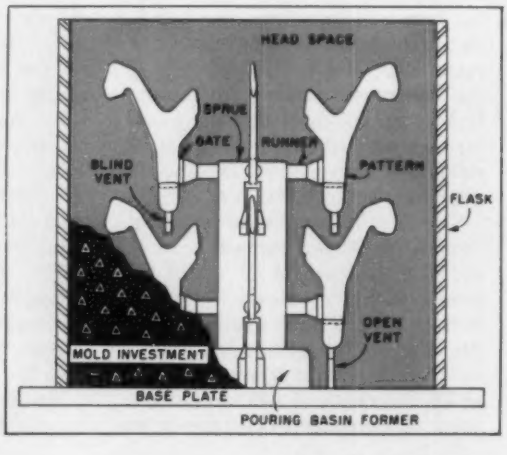


Fig. 1—Diagram illustrates typical nomenclature for different parts of a flask-type investment mold

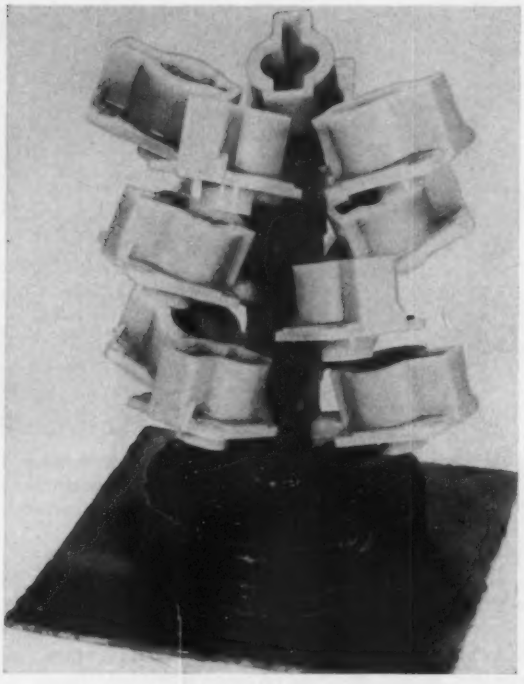


Fig. 2—These wax patterns are gated for investing in a round flask. Uniform section of part permits use of a single runner-gate

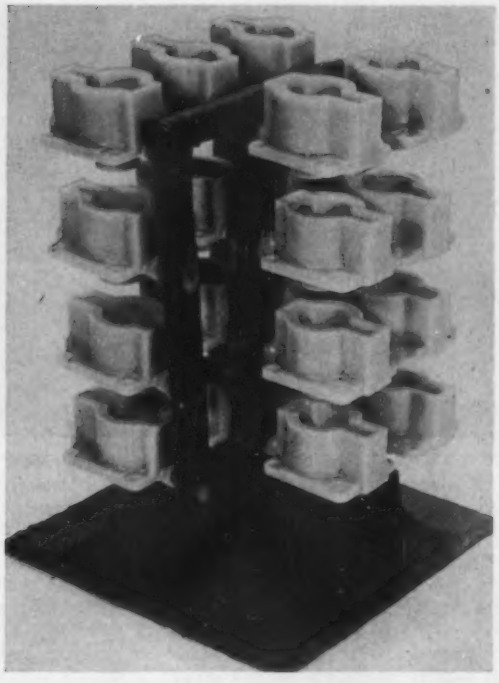


Fig. 3—Same part as shown in Fig. 2 is gated for production in a rectangular flask. One row of patterns is removed to improve view

may not be used, depending on feeding requirements of the mold.

If the pattern setup is to be molded in a flask, the sprue, with or without pouring basin former, is sealed to a base plate of cardboard, wood, rubber, or metal. If a shell investment mold is to be produced, provision is made for attaching a handle to the top of the sprue or pouring basin former to facilitate handling during dipping, stuccoing, and drying operations.

Rectangular or tubular runners provide the connection between sprue and gate on a pattern. The gate stub is affixed by hand to a pattern or it can be made an integral part of the pattern. Runners also can be made integrally with the patterns for certain casting designs. Doing so saves time and labor in the assembly of pattern setups.

A vent is formed in a mold by a small diameter rod of the pattern material. Under certain conditions it is attached to sections of a pattern. The vent evacuates gas which may become trapped in the mold cavity when metal is poured. An open vent extends through the mold to the atmosphere, and in addition to exhausting mold gas it serves to relieve partial vacuum created in a mold cavity as the pattern setup is melted out of the mold. A blind vent is confined within the mold and may extend $\frac{5}{8}$ to 2 in. from the pattern cavity into the mold material.

In flask molding when a flask has been placed around the pattern setup on a base plate and filled with investment mold slurry it is called an invested flask. Head space is the space between the top of the pattern setup and the top of the flask or mold as the pattern is invested. The head space end of the mold is the bottom when the mold is in position to receive the molten metal.

Design of the gating system must provide the following: 1. Fast, easy assembly of the pattern setup. 2. Sufficient strength to withstand deformation or breakage of the setup during mold making. 3. Unrestricted flow of the expendable pattern and gating material from the mold cavities, without damage to the mold, upon application of heat. 4. Proper directional solidification of metal after the mold is poured to produce metallurgically-sound castings. 5. Fast, easy removal of castings from the gating system after mold material is broken away from the cast.

Silica-base refractory materials generally are used to make molds for both ferrous and nonferrous alloys. Binders used in making molds for ferrous castings may be a silicate, phosphate, aluminate, or other similar material. Molds to receive nonferrous alloys usually are bonded with alpha gypsum.

Flask Molding—Patterns for ferrous castings generally are invested with a primary refractory wash layer applied directly to the setup. While this precoat layer is still wet, refractory particles are showered over it to form a stucco. After drying, the setup is surrounded with a flask and the back-up investment poured into the flask, being keyed to the precoat by the stucco particles. These molds commonly are known as solid molds. The orientation of the patterns in a setup is an important factor in the ease with which the precoating and stuccoing operations can be performed.

Precoat of patterns for solid molds is applied either by spraying or dipping the setup into a slurry

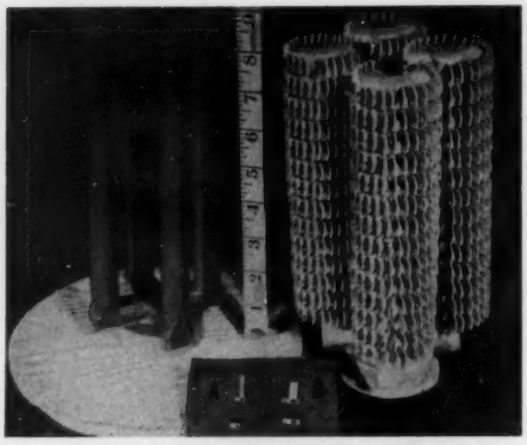


Fig. 4—Setup contains 1250 B patterns with integral runners. Each B casting will weigh only ¼ gram; the A casting is half as large

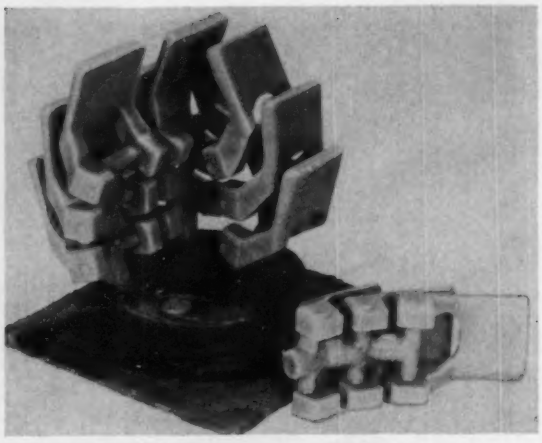


Fig. 5—Setup of patterns adaptable to nesting is shown. Example shows that this type setup does not require separately fabricated sprues

pot. If the setup is sprayed, intricate detail in the patterns should face outward from the setup where it is readily accessible to the spray. If dip coated, the patterns should be oriented to prevent trapping of air pockets in the pot and poor drainage after withdrawal from the pot. Enough space must be left between patterns and gate components to permit room for stucco and some back-up investment. Usually the minimum allowable distance in flask molding is 3/16 to ¼ in.

The invested mold, employing wax or plastic patterns, cures at room temperature for a short time and then may be placed in a meltout oven at 100 to 200° F to complete the chemical action of the mold material, to dry the mold, and to remove the bulk of the pattern and gating material. The molds then are fired at 1300 to 1900° F to drive off residual pattern material.

In some instances the low temperature meltout is omitted and molds are dewaxed and fired in one operation. Molten metal is poured into the hot mold after it is removed from the oven. Solid molds generally are above 1200° F at time of pouring because cooling them below that temperature without cracking of the refractory by thermal stresses is difficult.

Nonferrous Practice—Molds for nonferrous alloys use the alpha gypsum binder to the extent of about 30 per cent by weight. Pattern setups for nonferrous castings generally are not precoated before flasking and investing. After curing at room temperature, molds of this type need not be placed in low temperature ovens first but may be fired immediately at 900 to 1300° F. These molds must be poured above 400 to 600° F if serious mold cracking is to be avoided. Frozen mercury patterns are removed by letting them thaw at room temperature. The molds then are fired. All molds become permeable during the firing cycle.

The consequence of solidification in a hot, dry, solid mold has been calculated under the conditions shown in Table I. Time required to solidify a given section is inversely proportional to the square of the difference between the freezing point of the metal and the temperature of the mold. The comparison is between a dry sand mold at 100° F and a solid investment mold at a typical temperature for the given alloy. It can be seen that freezing is four to seven times slower in the flask investment mold.

The implication of this longer freezing time is that the metal can flow into extended thin sections without premature freezing. Thus, the number of runners and gates required to deliver hot metal is considerably less than that required for a dry sand mold.

Likewise, if misruns develop in an investment casting, the mold temperature can be raised rather than altering the gating system. This is a factor of flexibility not available in a sand mold where only the pouring temperature of the metal can be raised.

Pattern Orientation—The orientation of patterns in a setup for flask molding is not completely governed by considerations of fluid flow and feeding for soundness. Patterns must be oriented, in addition, by the requirements for investing. The investment slurry normally is poured into the flask with a technique designed to insure good contact between the patterns and the refractory. If this is not achieved, the metal castings will exhibit surface defects such as pimples, rough areas, and veining which are indicative of air or liquid being trapped between the patterns and the refractory.

Air entrapment is most apt to occur if a pattern has a blind pocket configuration which is pointing toward the sprue button. Under these conditions, the investment slurry has difficulty displacing the air in the pocket regardless of vacuuming or shaking treatments. The only cure is to shift the position of the pattern so that the air can float freely upward when the slurry is poured.

It is likewise poor practice to have any sizable flat area in the casting oriented horizontally facing the pouring basin former. The difficulty here is that the slurry components are not stable with time. With or without vibration treatment, the solid particles of invest-

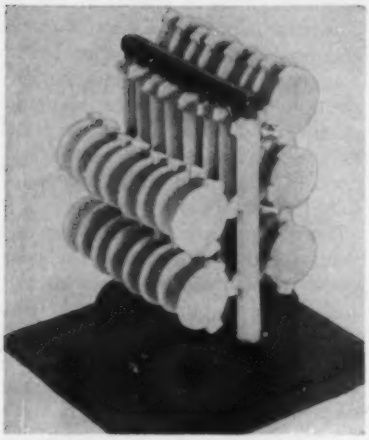


Fig. 6—Gating technique is illustrated for patterns turned out six at a time in one die

TABLE I—Freezing Time in Dry Sand vs. Solid Investment Molds

Alloy	T_f, °F	Dry Sand Tm, °F	Dry Sand $(T_f-100)^2\times10^{-4}$	Investment Mold Tm, °F	Investment Mold $(T_f Tm)^2\times10^{-4}$	Relative Freezing Time $(T_f-Tm)^2$
Steel	2800	100	729	1600	144	5
Stainless steel	2500	100	576	1600	81	7
Bronze	1800	100	289	1000	64	4½
Aluminum	1100	100	100	600	25	4

T_f—Approximate freezing temperature of the metal.
Tm—Temperature of the mold (temperatures shown for investment molds are common for the alloys cited).

ment tend to sink and the liquid to migrate upward toward the flat area.

In nonferrous investment, this gives rise to a roughened casting surface having the so-called water mark defect. In ferrous investments, the condition is evidenced by spalling or buckling of the precoat layer which is not firmly supported because of the sinking of the backup investment. Obviously, the remedy for these defects is to orient large, flat areas with an edge facing upward or inclined at an angle to the vertical.

Avoid Overcrowding—In arranging patterns on a gating system, care must be taken to avoid overcrowding any horizontal plane in the flask. This tends to weaken the mechanical strength of such a plane in the investment and makes it susceptible to fracture under the stress of the metal-pouring operation. If pouring is done by some forceful method such as centrifuging or suction, rather large forces are applied to the investment. Failure of the investment usually occurs in a horizonal plane near the head of the flask, and these failures are known as blow-outs.

The cutting off and finishing of the casting can be unnecessarily costly unless this factor is given careful consideration in gating. Most castings must be cut off with a band saw, abrasive cut-off wheel, or other appropriate tool. To minimize cut-off labor, patterns should be gated so that a clear opening exists between the gate area of the casting and the cutting edge of the tool. That means that other castings or parts of the gating system do not obstruct the path of the tool nor does orientation of nearby castings expose them to accidental nicks by the cutter.

Gate pads on external flat planes are easier to remove than those placed on rounded surfaces, and gate pads placed within the confines of a casting require a machining operation to remove them flush with the surface of the part.

Flask Molding Examples—Fig. 2 and 3 show the pattern setup for a part of fairly uniform section size and therefore adaptable to being fed by a single runner-gate attached to the sprue. The setup in Fig. 2 is suitable for a round flask; the setup in Fig. 3 is for a rectangular flask. Square or rectangular flasks sometimes are favored for castings of a certain design because they can hold more patterns per unit volume of refractory. The multi-sprue arrangement shown in Fig. 3 also facilitates the cutting of castings from the gating system.

In both the circular and rectangular arrangement, the feeding conditions are similar. The sprues occupy central or interior positions relative to the castings. This permits the more rapid solidification of the castings in the outer part of the flask which is losing heat most rapidly. The sprues tend to remain hot because they are surrounded by the castings which are radiating heat toward the sprues from all sides. Passage of the metal through the sprues also heats the adjoining investment material, and this likewise helps to delay solidification. Grant[1] has shown that test bar values are influenced by whether they are cast in the central or outer part of the flask.

Fig. 4 shows the gating arrangement for miniature 20C beryllium copper parts produced in a solid mold poured with suction assist. The individual pieces in the foreground

Fig. 7—Gate A is an integral part, and runners B and C are welded on. Total weight of the cast setup is 5.3 lb of 356 aluminum alloy

show that a runner is made as an integral part of the wax pattern.

The pattern setup is composed of the patterns fastened to four sprues joined by 3½-in.-long cross bars wax-welded to a pouring basin former 2¼-in. in diam and ⅝ in. thick. Sprues are straight sides, round rods of wax ¾ in. in diam and 7½ in. long.

Similar setups contain 1250 of the ¼-gram B parts or 1500 of the A parts which are half the size of part B. All castings can be removed from either setup in about 2¼ minutes with an abrasive cut-off disc and are degated in an air-operated pinch jaw machine.

Use Nesting System—Fig. 5 shows a method of setting up patterns which lend themselves to nesting. This type of setup does not require separately-fabricated sprues. Instead, they are fabricated by welding together the stumps of the wax pattern runners. Sprues of the separate pattern assemblies then are wax-welded to the pouring basin former. It should be noted that the sprues in this setup are located centrally and so are protected by the surrounding castings from premature freezing.

High volume production of small parts requires patterns in large numbers. Multiple pattern dies may be used to produce these economically. The six-pattern spray shown in Fig. 6 was produced by a single injection of pattern material in a die. Eight of the sprays were wax-welded to a pouring basin former and a wax tie bar welded across the ends of the sprues to strengthen the setup for subsequent solid molding operations. The making of one-piece sprays is adaptable to suitably-shaped parts and offers production economies since individual handling of patterns is eliminated during setup.

The pattern setup in Fig. 7 contains eight pieces to be cast in 356 aluminum alloy. The solid mold is poured with 5.3 lb of metal under suction assist. Each wax pattern is injected with a gate A at the midpoint. Runners B and C are ⅜ in. round wax rods formed individually and welded to the patterns and sprue as shown. The sprue is conical, tapering from 2 in. in diam at the pouring end to 1¾ in. The pouring end is shown waxwelded to the wooden base plate.

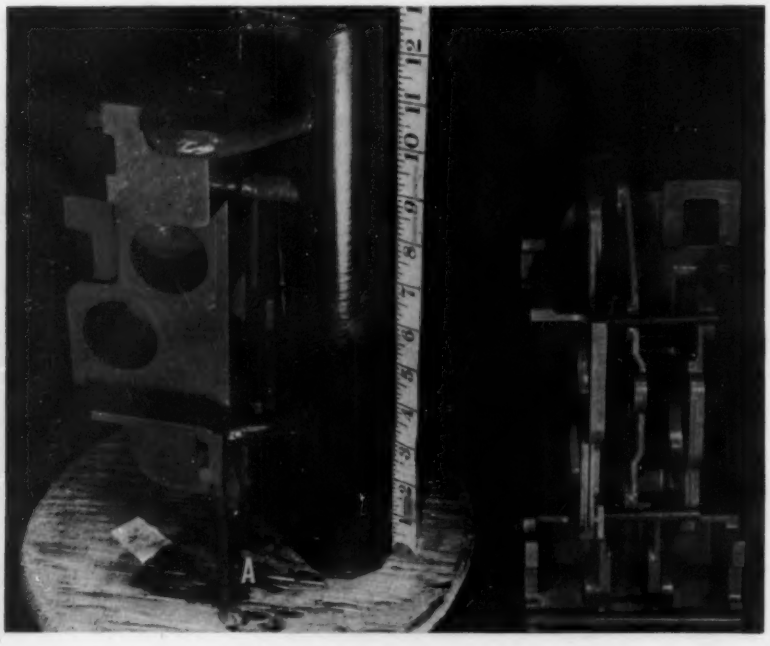
The pattern setup for one 356 aluminum alloy casting requiring extensive gating is shown in Fig. 8. The solid mold took 5.4 lb. of metal and was poured with suction assist. The pattern is mounted in a vertical position parallel with the sprue to permit use of a small diameter flask as well as to achieve best metal flow in the mold and directional solidification in the casting.

Three vents are mounted between points of the pattern and the base plate. They will be open to the atmosphere at top of the mold and will exhaust mold gases during pouring. Five ⅝-in.-diam runners connect areas of the pattern with the sides of the 13-in. sprue. A sixth runner which is at the bottom end of the sprue when the mold is in pouring position is blended into a ⅜ x 1⅛ in. gate pad attached to the casting. The sprue is tapered from 2 in. in diam at the pouring end to 1¾ in.

Castings such as the one shown in Fig. 8, having thin, rangy areas, require a network of runners to insure filling of all sections of the mold cavity without resorting to excessive mold or metal pouring temperatures. If too few runners are used, localized metal flow patterns may be induced. They lead to unsoundness. The localized flow overheats the particular area of investment thus delaying solidification of the metal in contact with it. This metal then acts as a riser in feeding adjoining casting areas.

Isolated heavy sections of castings require separate feeding. This generally is accomplished by providing a runner to the section. If feeding is to be successful, the runner section size must be larger than the section to be fed. A technique often effective is to use one or more massive down sprues which also act as risers. Short runner connections are made to the casting. Premature freezing of the runners is avoided by keeping them short. The metal flowing through them into the casting also tends to heat the adjoining refractory sufficiently to prevent stoppage of feeding. With this type of gating system, the structural stability of the wax setup is well assured.

Fig. 8—Thin, rangy areas of this casting require six runners for proper feeding. A total of 5.4 lb of 356 aluminum alloy is poured in the mold



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(To be concluded)

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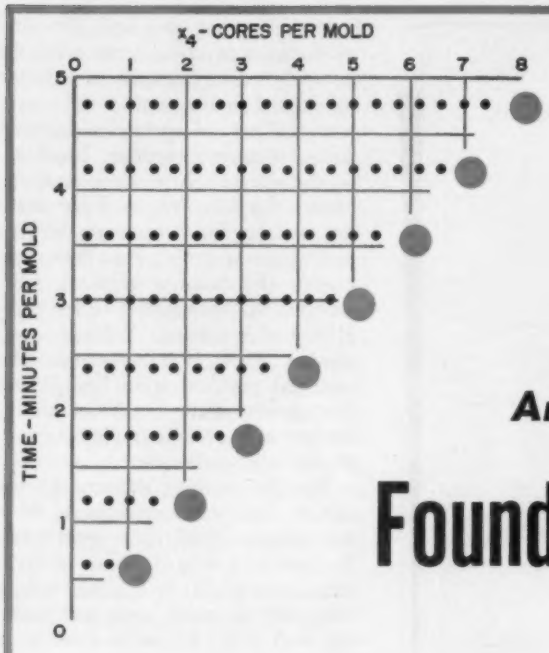

Fig. 1—This chart is used to determine the part of molding time due to molding factor X_4. This value is added to times derived from the other factors to give molding time in minutes

An Improved Method for

Foundry Estimating

New scientific methods being taught in engineering schools can be used in today's foundries. This article discusses an application of statistics to estimating molding and coremaking times

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and

E. PAUL DeGARMO
Professor of Industrial Engineering
University of California

● ONE of the difficult and important problems facing the manager of a jobbing foundry is to estimate the manhour requirements in each section to meet the scheduled load. Work-force requirements, pricing, and financial success depend on the accuracy of these estimates.

Because of the importance of such estimates and the difficulty of making them, most foundries have them made by personnel with an extensive background of foundry practices. These practices and the estimating involve considerable art.

It is hard to criticize this estimating procedure when one considers the many complex factors that go into casting and the difficulty of combining them into one reasonable composite estimate. Yet it is no secret that many such estimates do not possess adequate accuracy and that more rational methods are needed which will be more accurate and which can be made by less experienced personnel.

Some attempts have been made in this direction with the techniques of standard data,[1,2,3] but it appears that they are applicable only to the particular foundry under study, and in some cases they include data that are not really necessary to predict processing time. The purpose of the study described here was to devise and test a procedure for obtaining estimating formulas based only on key physical characteristics that determine process time in any department of any foundry; each foundry, however, must make studies and calculations to determine its particular constants which are required in such formulas.[2]

The method involves some use of modern statistical techniques and the use of a small amount of electronic computer time, but many foundries now have, or soon will have, young engineers on their staffs who already understand, or can easily learn, the statistical procedures, and computer time can readily be purchased in most metropolitan centers.

Comparative Results—The study was conducted in a typical gray iron jobbing foundry in the San Francisco Bay area which produces castings weighing from ½ to 100 pounds. The same or equivalent equipment is used for about 80 per cent of its work. Detailed records were available of the estimated and actual times on each job. It was decided to limit this study to two basic operations—coremaking and molding—which accounted for approximately 70 per cent of the manhours consumed.

To establish a basis for comparison, the degree of accuracy that was being obtained by the existing methods of estimating in the two

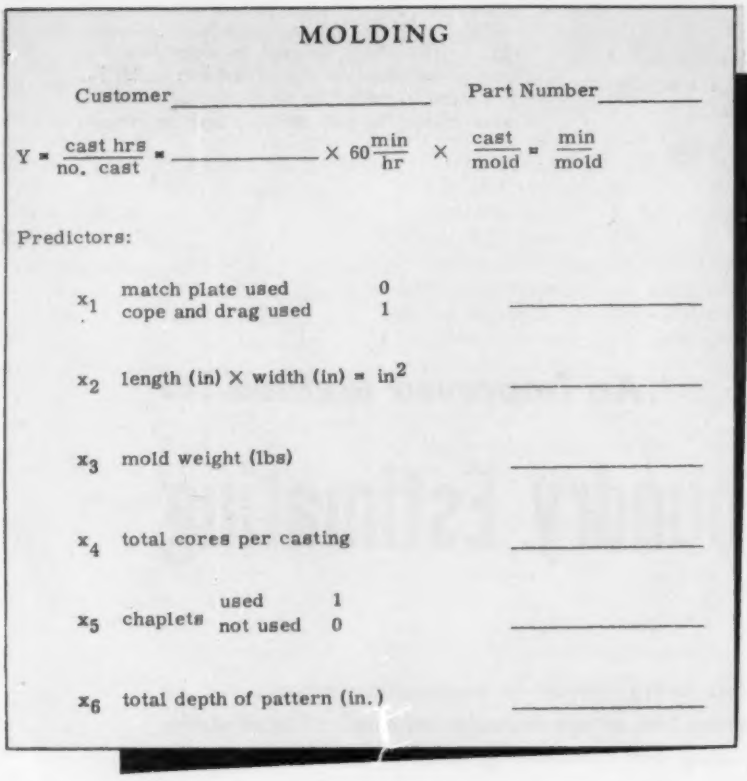
MOLDING
Customer
Part Number
Y = cast hrs / no. cast = ____ × 60 min/hr × cast/mold = min/mold
Predictors:
x1 match plate used 0
cope and drag used 1
x2 length (in) × width (in) = in2
x3 mold weight (lbs)
x4 total cores per casting
x5 chaplets used 1
not used 0
x6 total depth of pattern (in.)

Fig. 2—A data sheet like this is used to collect information required to compute a formula for estimating times to make molds

particular departments was found to be as follows:

	Coremaking (Minutes per casting)	Molding (Minutes per mold)
Estimator's Accuracy:		
68% of the time	± 9.2	±4.9
96% of the time	±18.4	±9.8
Range of times	0.25-27	1.38-15

After the study was completed and the estimating formulas derived, it was found that through their use the accuracies that could be obtained were:

	Coremaking (Minutes per casting)	Molding (Minutes per mold)
Estimator's Accuracy:		
68% of the time ...	±3.10	±2.27
96% of the time ...	±6.20	±4.54
Reduction of error	..2/3 approx.	1/2 approx.

It is apparent that the new method gave considerable improvement in accuracy, but it also was significant that the estimates could be and were made by a person who had much less experience with foundry operations and at doing estimating.

Deriving the New Method—The method used in this study is called multiple linear regression. We desire to predict the value of a variable Y (the time per casting in this case) for any given values of a group of variables, x_1, x_2, x_3, etc. (any measurable factors that might affect the process time). Sometimes a physical law connects the variables so that Y may be expressed as a function of the x's. For instance, the familiar formula $Y = \frac{1}{2} gx^2$ enables one to determine the distance traversed by a falling body in time x. Not all data follow regular laws, however, and when plotted or graphed the resulting points lie scattered about some curve that represents the ideal formula.

Multiple regression analysis provides a systematic technique for estimating the unspecified constants from a set of data, for the special case where the relationships between the variables is assumed to be linear. A valuable byproduct of this type of analysis is that it also shows to what degree the various chosen factors affect the process time.

The first step is to determine what factors are thought to affect the process time. In selecting the factors they should be surveyed from the viewpoints of (1) how good a predictor they are, and (2) how available or practical is the predictor to apply. For example, one factor considered in connection with cores was the use of special supporting wires for narrow sections. Intuitively, the more of these wires used, the longer the time required for making a core; there were no records available, however, to determine exactly the number of wires used. Another example is that of the complexity of a casting. What is complexity? How is it measured? The essential problem is to find factors that predict time in almost all instances and are reasonably easy to obtain and calculate.

For the molding department the factors finally selected were: Y = minutes per mold; x_1 = matchplate 0, cope and drag 1; x_2 = pattern plate area (in.^{2}); x_3 = mold weight (lb); x_4 = total cores per mold (x_4 = 0, 1, 2, etc.); x_5 = total depth of pattern (in.).

In coremaking the selected factors were: Y = minutes per casting; z_1 = core plane area (in.^{2}); z_2 = core height (in.); z_3 = length divided by the height; z_4 = bedding sand used 1, bedding sand not used 0; z_5 = total pieces in the corebox (x_5 = 0, 1, 2, 3, etc.); z_6 = corebox blown 0, corebox not blown 1; z_7 = a factor which "weighs" each core factor (z's) and sums for all the cores making up a casting, thus converting from a "per core" basis to a "per casting" basis. (This had to be used to adapt the formula to computer use by making the regression go through the origin.)

Collecting the Data—The second step is to collect data from the actual foundry records and, by measuring patterns and cores as required, determine actual Y and x (or z) values. Some type of printed form is useful in this step. Fig. 2 and 3 show samples of those used in this study. Approximately sixty complete sets of data were obtained for this study.

The third step in the analysis is to prepare the information for reduction and calculation so an electronic computer can be utilized. Although the calculations could be done with a desk calculator, the IBM 701 did the work in about eight minutes, whereas it was estimated that about five months would have been required on a desk calculator.

To use a computer a suitable computer program must be available.

The one used is primarily a multiple linear regression program[4], but it has several additional features, some of which are the following: Calculation of means, standard deviations, simple correlations; the feature of being able to form a multiple regression involving any subset of the variables; and for a regression equation as determined in the multiple regression portion of the program the analysis will compute the calculated value and the difference (called residuals) between observed (actual) and calculated values of the dependent variable for each observation.

Through proper use of the computer program, and by making several runs on the computer, one can determine whether the various predictive factors actually are significant in determining the operation time and thus eliminate those that are not needed (or add new ones if needed). For molding, five factors, $x_1 - x_5$, had been selected originally. It was found that the first one, x_1 (matchplate or cope-and-drag), was not needed. The resulting equation was $Y = -1.304 + 0.014x_2 + 0.033x_3 + 0.599x_4 + 0.095x_5$.

For coremaking, factors z_4 and z_6 were found to be not significant. The resulting regression equation was $Y = 0.068z_1 - 0.092z_2 - 0.114z_3 + 0.441z_5 + 0.752z_7$.

Use of these two equations permits the time required for molding or coremaking to be estimated from physical measurements alone, without the exercise of subjective judgment. For each factor a chart can be prepared from which the corresponding time value can be obtained without the necessity of multiplication being done. One of these, for molding factor x_4, is shown in Fig. 1. Thus to estimate molding time, values are picked from four charts and added to the constant—1.304. For estimating coremaking time values are taken from five charts and added together.

It should be remembered that these equations and the constants apply only to, and can be used for estimating in, the particular foundry for which the study was made. However, by following the procedure outlined here any foundry can obtain similar equations.

Conclusion—Through the use of mutiple linear regression, analysis equations can be derived which will permit the estimating of process times in a foundry with greater accuracy than usually is obtained by customary practices which are based on past experience. Such formulas can be applied by persons having only modest amounts of experience in a foundry. Each foundry would have to derive its own formulas and constants so as to have them reflect its equipment and practices. Such formulas are not cure-alls for the estimating problem and must be used intelligently. They do, however, appear to be useful and to be a step toward placing estimating on a sounder basis than it is at present.

As a general note, it appears from this study that the degree of success of any foundry in attempting to apply a technique such as this will be determined by:

1. Availability of reasonably complete and accurate historical records of times and dimensions.

2. Having someone in the foundry who can devote time to development and follow-up on the equations and to changing the constants as procedural changes or new equipment are introduced.

Obviously, only the basic theory and procedure have been given here. Complete details of the study, including the statistical procedures used, are contained in a thesis entitled "A Statistical Analysis for Foundry Estimating" by Gary G. Stone. This thesis is on file in the University of California library. Those who wish copies may obtain them at a cost of $5 by writing to the Department of Industrial Engineering at the University of California, Berkeley, Calif.

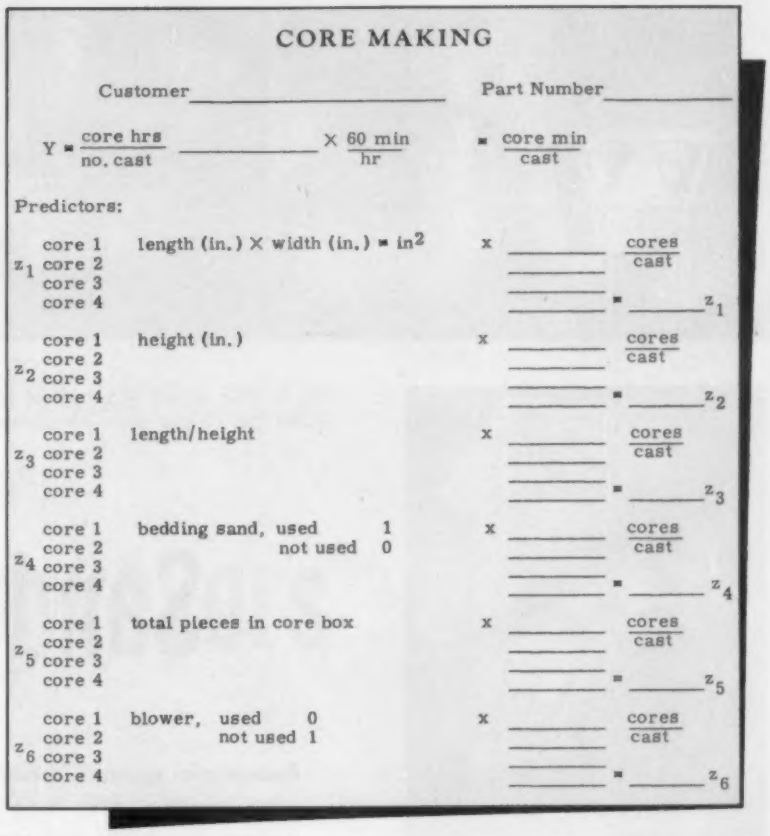
CORE MAKING
Customer
Part Number
Y = core hrs / no. cast × 60 min / hr = core min / cast
Predictors:
core 1 length (in.) × width (in.) = in²
core 1 height (in.)
core 1 length/height
core 1 bedding sand, used 1 not used 0
core 1 total pieces in core box
core 1 blower, used 0 not used 1
cores / cast

Fig. 3—Sample data sheet is for estimating coremaking time. Information recorded on such sheets is fed into an electronic computer

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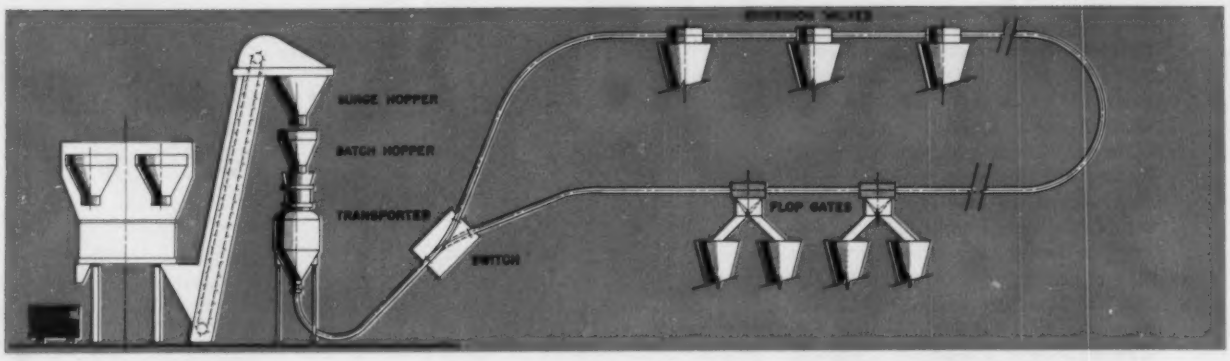


Fig. 1—This layout of a typical high-pressure air conveyor system illustrates the various basic components included in such a system

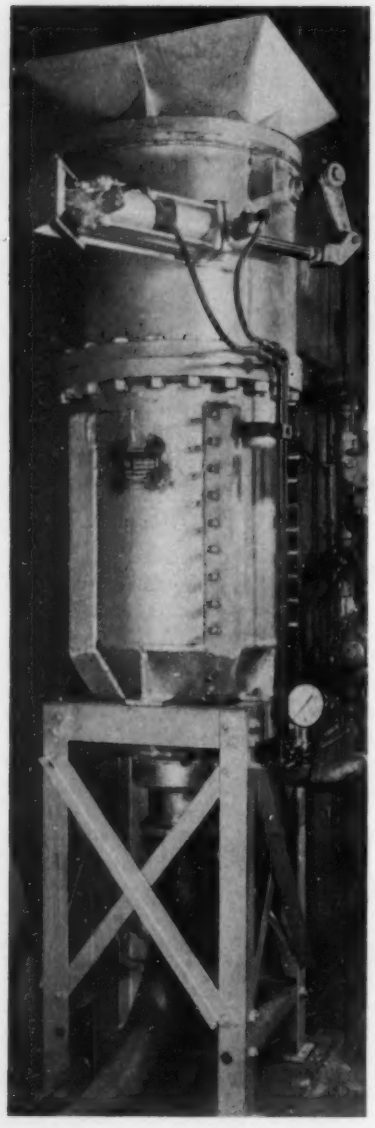


Fig. 2—View of sand transporter shows triangular-shaped compressed air channels and a line of adjustable nozzles

Sand Handling

Pneumatic systems move sand efficiently, before or after mulling, over long distances. Their advantages include flexibility and space savings

● PNEUMATIC SYSTEMS provide a means for the efficient movement of foundry sand both before and after mulling. They offer special advantages when the sand preparation units are far from new sand receiving points or when prepared sand delivery stations are remote or not in a straight line.

Flexibility in layout and space-saving characteristics of these systems also make them particularly useful when an existing foundry is to be modernized.

Types of System—The two basic kinds of air conveying systems are the suction and pressure types. In both methods, the sand is moved within a pipe by high-velocity air. Air movement in the suction type conveyors is induced by an exhauster behind the sand receiver; in the pressure system the air movement is generated by a blower in front of the sand receiver.

Pressure type conveyors also can be divided into two groups: Low-pressure (3-4 psi) continuous type, and high-pressure (30-40 psi) batch type. Since far more emphasis is placed on high-pressure type air conveyors, which are able to handle all kinds of foundry sands, only this type will be discussed.

A basic layout of the system is shown in Fig. 1 and includes all of the essential elements. Additional layouts to be discussed will deal with new and prepared sand and will also illustrate combination systems of belt and air conveyors.

Sand Transporter — The transporter is the heart of the system. It is a pressure vessel of cylindrical shape with a conical bottom which leads to a steel pipe conveying line (Fig. 2). Its capacities range from 7½ to 60 cu ft. Sand batches are dumped through an opening at the top of the transporter. A swing gate actuated by an air cylinder closes this opening when the batch is ready to be transported.

Six steel angles, spaced at equal intervals, are welded around the periphery of the transporter. These

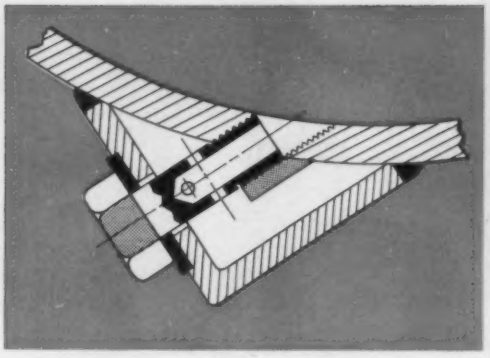


Fig. 3—Sectional view shows details of air channel, nozzle

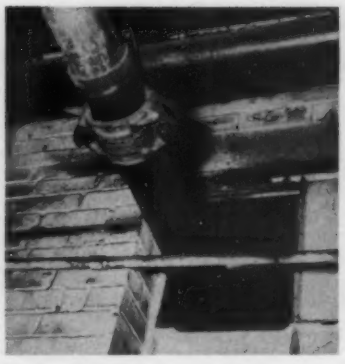


Fig. 4—Conveyor pipe is suspended from building members

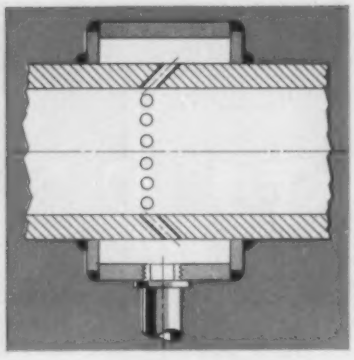


Fig. 5—Booster unit, built as shown here, keeps sand moving

By Air Conveyors

By H. W. ZIMNAWODA
Sales Manager
National Engineering Co. of Canada Ltd.
Chicago

angles extend from the top of the cylindrical part to the bottom of the cone. They form triangular-shaped channels closed on the top. The bottom part of each channel is connected to the air plenum ring-chamber, which receives the compressed air supply through a 2-in. pipe.

Compressed air, introduced to the triangular-shaped conduits, is forced through the nozzles into the transporter. These nozzles, positioned at different elevations, penetrate the wall at a tangent to the interior of the transporter. They do not protrude into the vessel, consequently they present a smooth, unobstructed inside surface. Each nozzle (Fig. 3) is drilled so that the air enters through the opening near the head and blows out through the opening at the end. By adjusting these nozzles from outside, the direction of compressed air jets can be varied according to the requirements of different types of sand.

The size of the air stream developed by each nozzle may be increased or decreased to suit requirements of the material to be conveyed. When a heavier type of prepared sand is being used and a stronger pneumatic force must be applied, nozzles having larger size outlets should be used. On the other hand, if a weak prepared sand or dry sand is used, smaller nozzle openings are more suitable. This feature makes it possible to obtain maximum fluidization of the sand in the transporter before blowing. It prevents bottleneck packing and the extrusion of the sand in slugs, and provides for smooth operation and efficient usage of compressed air.

After charging of the transporter, closing of top door, and applying of compressed air, the sand batch is exposed to the action of a plurality of air streams ejected by the jet nozzles. The air flow, in a certain pre-established pattern, fluidizes and swirls the batch, providing for a spiral entering of sand into the pipe conveying line.

Piping, Couplings, Boosters — When a batch of sand starts to leave the transporter, it must be kept in motion in the pipeline until it is delivered to the receiving point. The pipeline usually is made of 4 or 5-in. diam standard extra-heavy steel pipe. The path of the line is laid out to keep bends or curves to a minimum. The pipe, following any desired course below or above obstructions, can even be passed through a window (Fig. 4) and is simply suspended from existing building members.

Auxiliary aeration jets or boosters may be installed at critical points if necessary. A booster (Fig. 5) consists of a 2-ft. section of pipe with a pad welded around its circumference to form a ring-shaped chamber to which a compressed air supply is connected. Holes of ⅛-in. diam are drilled through the batch conveying pipe at such an angle that the passing sand is given

Fig. 6—Conveyor pipe leading to silo uses reinforced bend

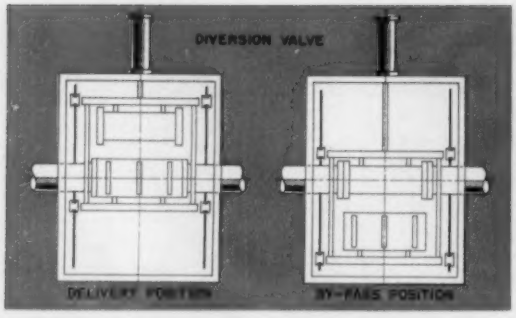


Fig. 7—Schematic view shows diversion valve in the delivery and bypass positions

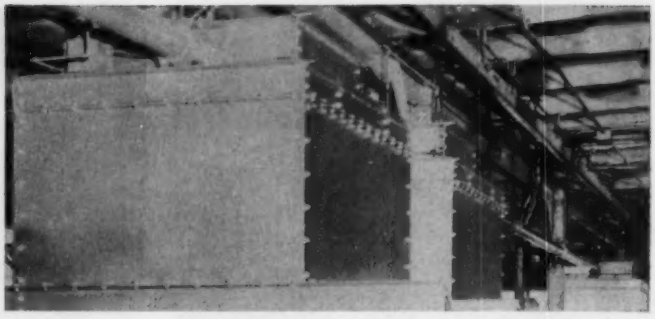


Fig. 8—Diversion valves are used, as shown here, to feed sand into hoppers at operating stations

an additional swirl to reinforce the one imparted by the nozzles of the transporter. The boosters, placed at strategic points, prevent the plugging of pipes.

To minimize wear and prevent packing, all pipe curves should be held to a minimum radius of 6 ft. The pipe bend closest to the transporter, where the sand velocity is low, has little wear compared with that of the bends farther away from the transporter. Several designs and materials have been used to prolong the life of these elbows. Best results have been obtained by welding to the outside of the curve a "steel wearing box" filled with a mixture of epoxy resin and silicon carbide. A right-angle bend with built-in air jet also is used successfully.

For conveying of core sand, rubber pipe bends have been found to out-last the steel ones. Because of the flexibility of rubber, it is possible to change the face of the curve and, in so doing, lengthen the life of a bend considerably.

Depending on the type of sand conveyed and the tendency of some materials to build up at the wear section of reinforced curves, some kind of cleaning must be done periodically. A release agent introduced at the transporter and the blowing of a chain through the pipeline will remove any material accumulations.

Fig. 6 illustrates the simplicity of the air conveyor system when used to fill a sand silo. The silo at the left, previously used for new sand, is now serviced by an air conveyor, loading reclaimed sand brought from a remotely situated sand scrubber.

Sand Receivers—Usually the sand is delivered to a number of stations by one pipe line through sand receivers positioned above each hopper. The last in the line is simply a baffle box, and the others are two-way diversion valves consisting of a straight pipe section and baffle box as shown in Fig. 7 and 8.

The diversion valve, designed to receive sand from either direction of the pipe line, is contained in a channel frame. A carriage, consisting of a movable section of the pipe line and a baffle box, is installed in this framework. It is moved on rollers by an air cylinder from a "diversion" to a "by-pass" position. Either the baffle box or the pipe section is put into alignment with the sand-conveying pipe and sealed in position.

The baffle box provides a means of deflecting the sand into the bin or hopper. It contains three rubber baffles which serve to absorb the shock of oncoming sand.

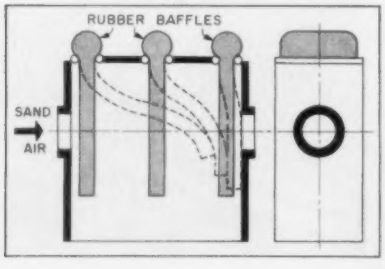
The rubber baffles hang loosely in the box and deflect the sand with a minimum of abrasion. The process of diversion of sand from the pipe is illustrated by Fig. 9 and 10.

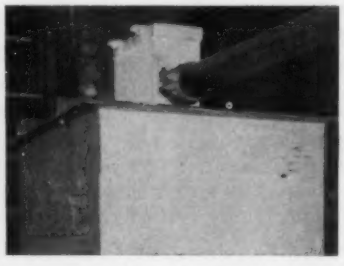
The baffles are approximately 1 in. thick and are reversible. They may be exchanged easily by lifting them out of their respective slots in the baffle box. When sand is received by the box, it pushes the first baffle into the box and against its closed top. The first baffle overlaps the center baffle, which also is pushed away by the sand and overlaps the third baffle. This last one is thus held against the far end of the box, sealing the opposite sand entrance opening.

When the valve is in either the delivery or the by-pass position, a clamping assembly, operated by a second cylinder, provides for accurate alignment of either part. A toggle linkage, operated by the carriage - actuating air cylinder, squeezes soft rubber gaskets and provides a tight seal for the pipe conveying line.

After a batch of sand has been delivered to the receiving hopper through the baffle box, the air pressure is released from the hopper through a vent pipe and cyclone. The small amount of air-borne material trapped by the cyclone is removed periodically. The use of bag type dust collector is recommended when fine dusty materials are conveyed.

Fig. 9—Drawing shows how a baffle box diverts sand into a hopper. Fig. 10 (right)—A baffle box is used for the hopper at the end of the line





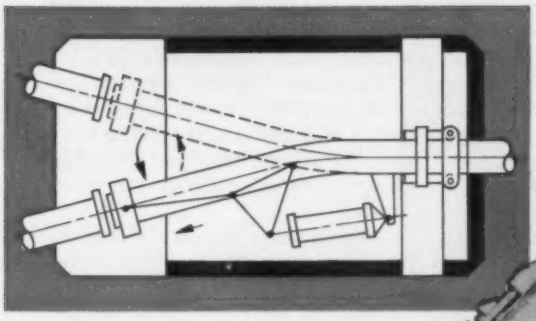


Fig. 11—Air cylinder sealing device on a transfer switch is shown in this schematic view

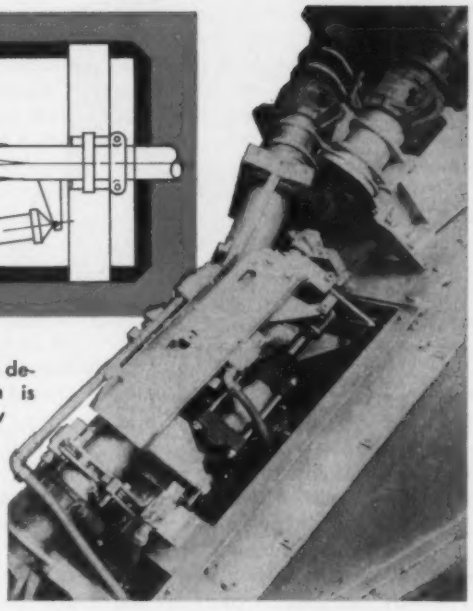


Fig. 12 — Photo depicts the mechanism for operating transfer switch

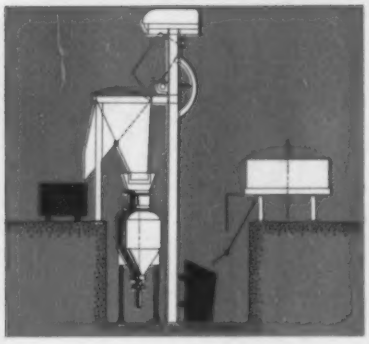


Fig. 13—Layout shows how bucket loader can be utilized for charging the transporter

Switch — A transfer switch installed in the pipe line makes it possible for the operator to convey sand to either one of the two branches of the main line. The mechanism of the switch is shown in Fig. 11 and 12. By means of two air cylinders, the transfer pipe section is moved from one location to another, accurately aligned, and sealed in the same way as the movable parts of the diversion valve.

Because of the two-way action of the sand receiving valves, no switches are needed at the diversion points. Since the curved pipe in the switch will be a point of wear, the number of switches used should be kept to a minimum, and they should be located close to the transporter where the sand velocity is low.

Operation and Control—The air conveying system is operated by one man at the control panel. Each receiving hopper is equipped with high and low level indicators connected with light signals on the panel. The red light indicates that the hopper is full; the green, that it is about empty. No light means that the transporter can accept material. Other lights indicate whether each switch and diversion valve is in the delivery or the by-pass position. There is also a set of lights showing if the door of the transporter is open or closed and one showing that the system is engaged in conveying material.

After selection of the delivery point, the operator fills the measuring hopper with material, charges the material into the transporter, and closes the transporter door. By actuating a switch which selects the receiving hopper, the baffle box of the selected diversion valve is moved into the delivery position and sealed automatically. At the same time all the diversion valves and switches between transporter and this particular station are set into by-pass position, accurately aligned and clamped either by actuating a second switch or automatically. Compressed air then is released into the transporter through the nozzles. While the batch is being fluidized, the pressure builds up until sufficient pressure to overcome the friction of the system is created; then the batch is flushed out and moves through the pipe toward its destination.

As soon as the batch is delivered, the air pressure drops rapidly toward zero. At that point, the air inlet valve closes automatically and the door of the transporter opens.

Sand Conveying Layouts — The layouts shown here are typical. They are the result of experience gained from successfully operating installations.

Fig. 1, discussed earlier, shows a practical arrangement of the essential elements for conveying of molding sand in foundry operations.

First, it should be noted that the pit usually required for the transporter has been omitted in this layout. This arrangement reduced the initial cost of installation, and the access for maintenance and supervision is simplified.

Second, a surge hopper has been installed above the measuring hopper. This feature, although it represents an additional piece of equipment, is recommended to provide a certain storage of sand and, consequently, an uninterrupted air conveyor operation. This surge hopper may have a capacity of one or more transporter batches.

Third, the unique bidirectional design of the sand receiving diversion valves permits delivery of sand through either of the branches of the pipe line and around the loop.

Fourth, it indicates how one diversion valve with a flop-gate can supply two molders' hoppers with sand. These hoppers, of smaller volume, are situated close together compared with the larger hoppers of the other pipe line.

In this layout, a high-speed cleated belt has been used for charging prepared molding sand into the transporter. Alternatives for core and new sand applications, where either a bucket loader or conventional elevator are used as charging units, are shown in Fig. 13 and 14, respectively. All three arrangements shown have provisions for a side discharge, bypassing the transporter.

Fig. 15 shows an arrangement for conveying and storage of new and/or reclaimed sand. The sand

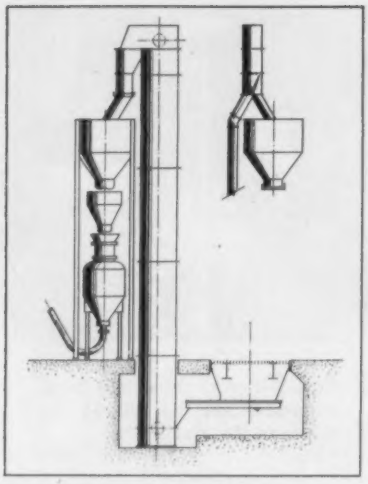


Fig. 14—In this case, an elevator charges the transporter

is charged by a bucket loader into a transporter and blown to either one of the two storage bins, or to remotely located receiving stations. On the other hand, sand from each storage bin can be charged into the transporter. This is done by gravity from one bin and by vibrating feeder from the other bin.

Fig. 16 shows an example of a combination air conveyor and belt conveyor system. This arrangement is recommended when a new sand preparing unit has been added to the sand handling system and the belt extended to serve more stations. It also may be used when an additional sand preparing unit has been installed in a location remote from an existing system.

Fig. 17 is another example of a combination setup. Here the belt conveyor is extended and provisions made for charging the transporter from which the sand is blown to the receiving points. This arrangement is suggested in case new stations have been added, especially when they are installed in remote positions and not in a straight line.

Maintenance—Amount of maintenance required of the air conveying system will be determined by the characteristics of the sand, length of piping, number of bends and the tonnage of sand conveyed. The only replacement parts are the curved sections of the pipe lines. Depending on the radius of the bend (the bigger the better) and velocity and characteristics of moved material, these curves wear out in different time periods. Usually there are only a few curved sections. In the layout they should be placed as near as possible to the transporter where the air velocity is the lowest. The reinforcement boxes filled with anti-abrasion material and welded on the outside surface of the bend reduce the maintenance cost considerably.

Compared with conventional sand handling systems, the total expense of maintenance for the same amount of sand conveyed should be lower when using the air conveying system.

The blowing pressure should be as low as possible and determined properly for the given system. Valves and bends should be inspected at frequent intervals. Air cylinders and electric controls also should be checked regularly. Breakdowns should not occur often, and a skilled man is not required to make repairs.

Advantages — The greatest advantage of pneumatic sand conveying is its unique feature of being unrestricted in its routing through the foundry. The pipe line can go up, down, or around obstacles and can economically cover considerable distances, both horizontally and vertically. It can deliver sand to any destination to which pipe can be run. It is dust and water proof. There is no spillage because the sand is fully enclosed. When used outside of the building, the conveying line does not need weather protection.

Easy suspension from existing steel members and quick connections by slip couplings make the installation and also any layout changes simple. Practically no floor space is required.

Sand is moved rapidly and arrives at its destination with good consistency. The turbulent movement fluffs or aerates the sand, and prepared mixes are not affected in transit. No skilled operator is necessary, and the system can be made fully automatic.

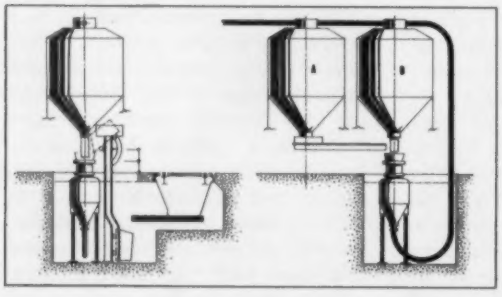


Fig. 15—One arrangement for conveying and storage of new and/or reclaimed foundry sand

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Fig. 16—This sand handling system, a combination of air and belt conveyors, is best for some uses

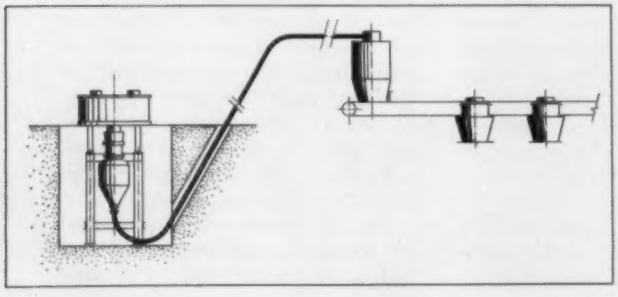
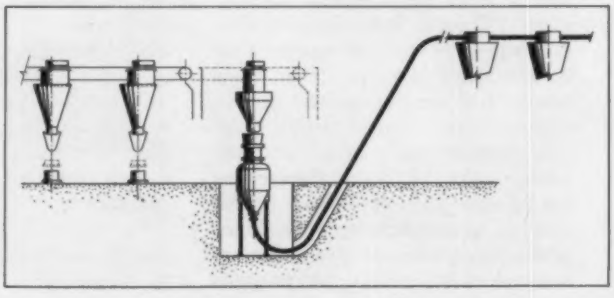


Fig. 17—Another combined system results from adding an air conveyor to an existing belt conveyor



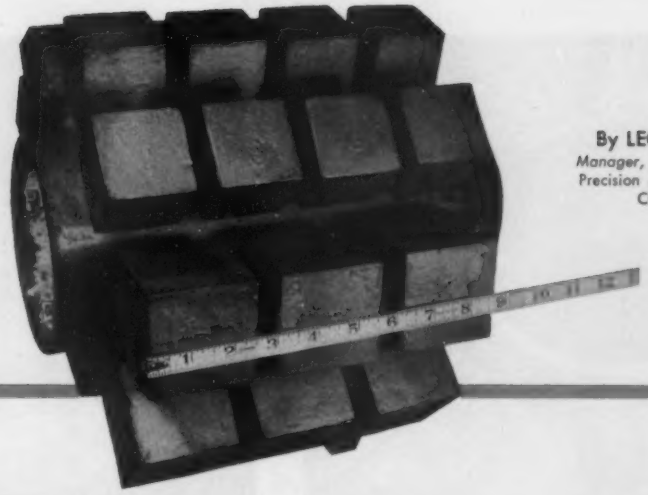


Fig. 1—Arrangement of test cubes around the hollow sprue to achieve thermal wedge effect is shown. Alloy is 17-4 PH

By LEO E. CARR
Manager, Special Products
Precision Metalsmiths Inc.
Cleveland

Do Old Theories Apply in New Technique of Gating?

Some metallurgists say it can't be done, but 2½-in. test cubes of stainless steel have been cast off a hollow sprue of ⅜-in. mean wall thickness. The test work is described here

● RESEARCH engineers at Precision Metalsmiths Inc., Cleveland, working to refine the company's recently developed hollow sprue gating system, have cast 2½-in. test cubes of 17-4 PH stainless steel off a cylindrical sprue having a mean wall thickness of ⅜ in.

Section thickness of the cubes from the ¼-in.-thick end of the tapered sprue wall is about ten times that of the sprue wall cross-section. The cubes weigh 4½ lb and are x-ray sound.

Briefly, the hollow sprue gating system consists of a pouring cup, the hollow sprue, and ingates (see FOUNDRY, January 1961, p. 58). The sprue is a cylinder with tapered wall sections. Mean thickness of sprue walls ranges from 3/16 to ¾ in., sprue lengths average 12 in., and diameters are 4, 5½, and 8 in. in present production gating systems.

Test Work—Early experimental and production work with hollow sprue mold setups resulted in an improvement in casting yield to about 50 per cent and to the making of castings with section thicknesses double that of the sprue wall.

At this point of development a series of tests was started to determine the maximum size castings which could be cast on a hollow sprue and to what extent yield could be improved. Test work was conducted under the guidance of R. L. Ashbrook, chief metallurgist.

Shell investment molds used in the tests were made from wax pattern setups incorporating a ⅜-in. mean wall thickness hollow sprue 5½ in. in diam and 12 in. long. The cubic test patterns were hand fabricated from block wax inasmuch as precision dies were not required for the desired cast results. The molds were poured with 17-4 PH and 410 stainless steel alloys.

Each of the setups in the first tests had twenty 1½-in. cubes and four bars 1 x 1 x 11 in. The cubes of 17-4 PH alloy weighed 2½ lb, and each bar weighed 3¼ lb for a total 63 lb of cast parts. Total gating system metal weighed 28.4 lb. The ratio of gating metal to castings of ½ to 1.1 provided a yield of nearly 69 per cent.

X-ray, Zyglo, and macroetching showed all cubes of 17-4 PH to be sound. In the 410 stainless cast setup, however, macroetching revealed a trace of shrinkage in cubes of the center row of three tightly packed rows. Of the four bars, one was sound by all tests. It had more space between it and the closest of the remaining three closely spaced bars. Those three showed indications of shrinkage.

The occurrence of shrinkage in the closely spaced cast shapes emphasized the importance of proper spac-

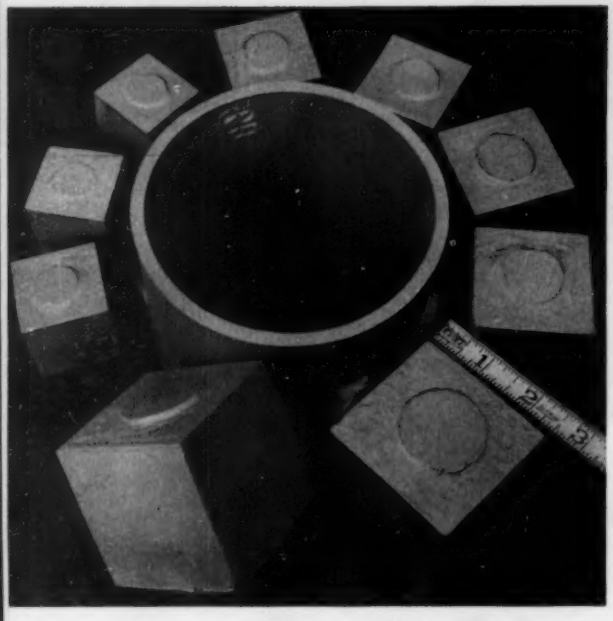


Fig. 2—Cube castings cut from the ¼-in.-thick end of the sprue show soundness at gate area

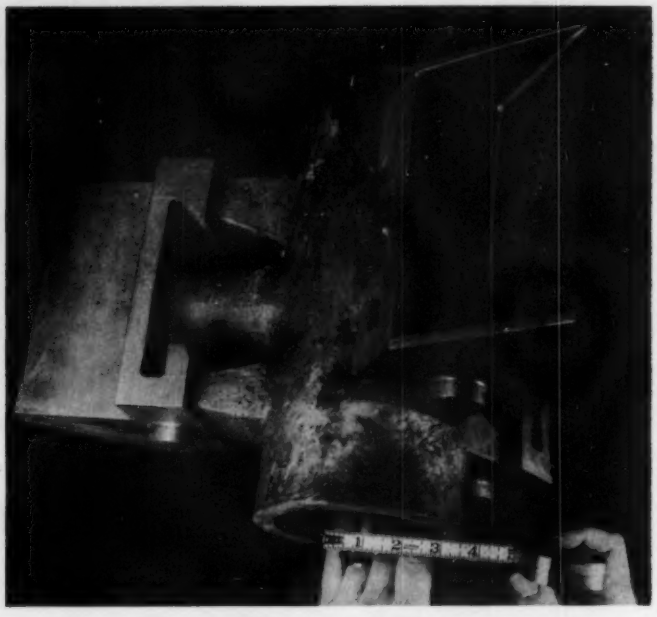


Fig. 3—Three 4330 steel castings, each weighing 15 lb, are cast from a ½ in. sprue section

ing of the parts around the sprue.

Try Larger Cubes—Because of the generally favorable results from the first group of tests, an additional series of experiments was started. The same size hollow sprue employed in the first tests was used. As shown in Fig. 1, 39 cubes, varying in size from 1½ to 2½ in., formed the setup. Breakdown of sizes and number of cubes was as follows: Ten 1½ in., fifteen 1¾ in., eight 2 in., and six 2½ in. cubes. The alloy was 17-4 PH stainless.

In the first cast setup of this type all the 1½ in. cubes were sound, as were 12 of the 1¾ in. cubes, four of the 2 in., and four of the 2½ in. cubes. Pouring techniques and temperatures of metal and mold had not yet been established. Additional tests were conducted with other ferrous as well as nonferrous alloys.

Thirty-six 17-4 PH stainless steel cubes were cast in the last mold of the test series. Those that were sound included all ten of the 1½ in. cubes, 12 out of 14 of the 1¾ in., six out of seven of the 2 in., and all five of the 2½ in. cubes. Soundness of the cubes was determined by x-raying to Air Force standards.

Fig. 1 shows the cast setup and indicates positioning and spacing of the cubes on the sprue. Fig. 2 shows cubes cut from the ¼-in. end of the sprue to reveal soundness at the gate area. Tests were stopped when the pouring technique and the proper relationship of metal temperature to mold temperature had been established to cast sound 2½-in. cubes.

Results of the test program proved the function of the hollow sprue gating system sufficiently to permit its use in regular production of parts having relatively large section thicknesses. Fig. 3 shows three production parts, weighing 15 lb each with the heaviest section measuring 4½ x 2 x 1¾ in. They are of 4330 steel alloy cast from a ½-in.-thick sprue wall.

How Is It Done?—The tests and experiments had been intended to push the feeding requirements of the cube castings beyond the capability of the hollow sprue. Although that goal was not achieved, the fact was established that a relatively heavy section such as a 2½ in. steel cube, weighing 4½ lb can be cast sound by x-ray standards through a sprue wall section ¼ in. thick.

A number of possible explanations have been considered in an attempt to explain this anomaly. The following factors are believed to contribute to the efficiency of the hollow sprue gating system.

Blanketing Effect: It is evident that a sprue centrally located in a cluster of several small castings will feed efficiently. Flexibility of the pattern setup in the investment casting process makes possible blanketing the hollow sprue almost completely with castings. Thus, rate of heat loss from the sprue is retarded.

Also, in most investment shells produced at PMI the mold material is thickest around the sprue, becoming thinner toward the outside (or periphery) of the complete mold setup. The insulating effect of the mold material thus is greater around the sprue and inner surfaces of castings. This also slows the heat loss from the sprue, and assists in proper directional solidification.

Fig. 4 shows the difference in refractory buildup and, consequently, mold thickness around castings, ingates, and sprue. Thinning of the mold wall toward the periphery of the setup results from spinning the pattern setup between slurry dipping and stuccoing operations during mold making. The spinning operation removes excess refractory slurry from the setup.

Thermal Wedge Effect: As shown in Fig. 1 and 5, a circular arrange-

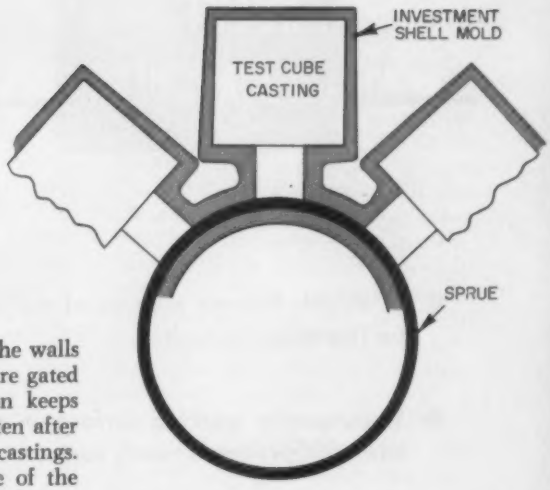
ment of castings around the sprue promotes directional solidification. Because the castings are placed radially on the sprue, they are closest together adjacent to the sprue and farthest apart at the periphery of the setup. Heat loss from adjacent castings on the radial planes is least at the gate area. This makes the castings freeze as if they were taper padded. A rectangular plate also will behave like a wedge and solidify progressively toward the sprue.

End Effect: This is used to advantage in the hollow sprue gating system. When castings are packed together closely, the outside end may be the only portion of a casting through which appreciable heat loss is achieved. The end effect is more pronounced than if the castings were isolated in the setup.

Superheated Sprue Effect: Since all of the molten metal that enters the mold must pass through the sprue, the sprue walls are heated to a temperature higher than the walls of the mold cavities which are gated to the sprue. This condition keeps feed metal in the sprue molten after metal has solidified in the castings.

Improves Quality — Use of the hollow sprue in production has permitted greater control of thermal gradients in molds by reducing sprue volume. Warpage, shrinkage, and hot tearing in castings have been reduced 90 per cent compared with castings gated off a solid sprue.

Fig. 4 — Differential in thickness of investment shell molds used to produce test cube castings is illustrated here



Two to four times as many parts can be cast in a mold by increasing the diameters of the sprues. The ratio of gating system metal to weight of castings is improved, and is as low as 0.3:1 to give a yield of over 75 per cent.

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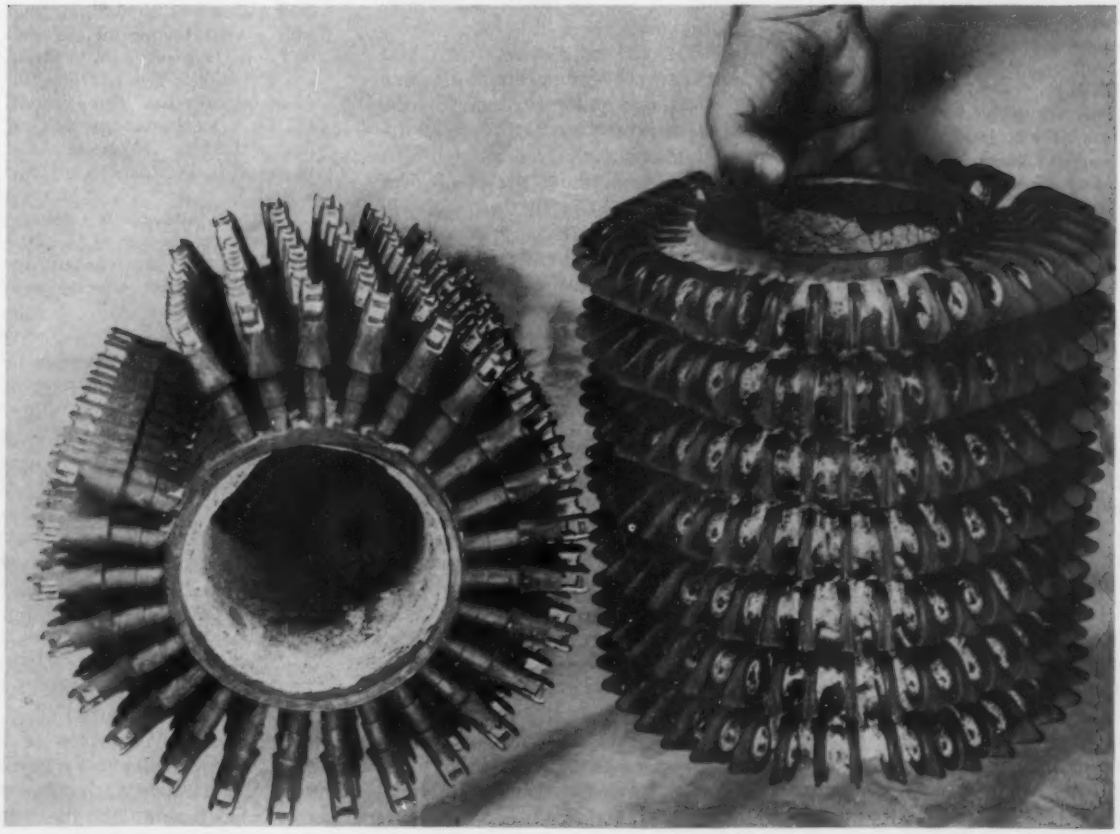
Fig. 5—Cast setups of small parts illustrate thermal wedge and blanketing effects and show the quantities of castings produced in one mold



QUESTIONS and ANSWERS

- **In electric furnace melting of red brass tin loss appears to be inordinately high**
- **High quality working surface on corebox and use of gypsum will provide smooth surface**
- **Close attention to a number of details will hold movement of core to the minimum**
- **Pock marks on surface of steel casting due to reoxidation of the molten metal**

Melting Loss of Tin is High

We are melting charges of 300 to 400 lb of 85-5-5-5 ingot in an indirect-arc electric furnace at 2200° F with no zinc additions and are having a tin loss of 0.75 to 1.00 per cent. The loss shows up in our sprue analysis. We have made sure that the charges have not been contaminated with metal of lower tin content unless it was in a "bad" ingot. Could this loss in tin be due to melting conditions in any way?

Your loss in tin alone is higher than the total loss figure generally attributed to melting in the indirect-arc furnace. St. John, in his book *Brass and Bronze Foundry Practice*, indicates that the melting furnace loss with such equipment is about 0.5 per cent. Although he does not mention the allocation of the loss to the different elements, it safely can be stated that the major portion is in zinc which volatilizes around 1700° F. Of course, higher losses are possible if the furnace door is left open and air is permitted to sweep through the furnace.

Mention is made that this tin loss is determined on the sprue, but nothing is said about whether any analysis has been made on samples taken at the furnace spout. In our opinion, that sampling would be necessary to determine whether the trouble lies in the furnace operation. If the metal over the spout shows the desired composition, then you might suspect the possibility of some type of segregation occurring in the sprue and the need to review the method of sampling.

If the analysis of the metal over the spout is at fault, then you will have to investigate the compositions of the raw materials charged. If those appear satisfactory, it will be necessary to study the melting operation to determine the cause and remedy.

Can Attain Smooth Surface

We are trying to make a sand-cast aluminum alloy casting of No. 355 alloy which requires a 50 rms cored surface. Can you suggest a plaster or ceramic that will give this finish?

The finish called for on the core surfaces of your casting is on the high side for a sand mold. Such finish, however, is readily attained on plaster mold and investment mold castings. For specific information on mold material formulations and use, inquire of suppliers of plaster and ceramic products for molding purposes.

Remember that the casting finish will be no better than that of the corebox. Working surface of the corebox must have a surface quality equal to or better than that desired on the casting.

Minimizing Core Movement

We are confronted constantly with the problem of maintaining core float or movement in various sizes of malleable castings. In many cases the customer specifies a plus or minus 1/64 in. regardless of the size of the casting, and again it might be 1/32 in. core movement maximum.

Most recent case is that of a casting weighing 46 lb which has an over-all length of 16½ in. The shell core used is 21 15/32 in. long with a print bearing on one end of 2½ in. long and 2 in. in diam, and 2½ in. long and 2 1/16 in. in diam. on the other. Specifications call for a maximum core shift or float of 1/32 in. Molds are made in pop-off flasks. Chaplets are prohibited.

Do you think this is a reasonable limit for the casting in question? Are there any standards or suggested tolerances covering core movement, etc.?

Answering your last question first, there are no standards or suggested tolerances relating to core shift so far as we know. We would expect that subject to be a matter of agreement between producer and consumer. With accurate pattern and corebox equipment, and first-class molding, coremaking, and core setting methods, it should be possible to hold core movement to the minimum.

As might be expected, a number of factors affect the obtaining of desired tolerances in internal cavities. They include the accuracy of the core print in relation to its bearing in the mold, since variations will permit movement of the core.

Check to see that the fit is as close as possible.

Another factor is rigidity or stiffness of the core under elevated temperature conditions. That is particularly important with long cores since they may bend under the pressure of molten metal. Often the cores have to be reinforced with metal rods to provide the desired stiffness.

You mention that you are using a shell core in this application, and it is possible that the walls are not thick enough to provide the necessary stiffness. We suggest that you try a longer dwell time to increase the wall thickness and observe the results. If bending or floating still occurs, it will be necessary to use a solid core, possibly with reinforcement.

You might also check the possibility of core warpage, which although not related to core movement, does have a direct bearing on accuracy of the internal cavity. It would be worth-while to set up a gaging fixture to see that the cores are true to form where close tolerances must be maintained. The same applies to development of a core setting fixture which will insure that the core is located properly.

Inclusions Show on Surface

We have an inclusion problem on the surfaces of our steel castings and are forwarding a section from one for your examination. It is from a framelike casting about 4 ft square, 4 in. deep, ½-in. section, with a 4-in. flange around the top. It is made from basic electric furnace, SAE 1030, plain carbon steel which is poured from brick-lined, bottom-pour ladles into green sand molds, washed and dried.

The casting and rigging are clean and free from scabs and erosion, and there is no apparent evidence of the molds contributing to the surface inclusions. Ladles are lined with fireclay brick (average life, 18 heats). The brick is sprayed with zircon wash, and the bottom is covered with a ½-in. layer of zircon. Spectrograph results show the surface inclusions to be largely silicon, aluminum, managanese, and magnesium. Can you supply any information on the cause and cure for this type of defect?

Your problem is one that has plagued steel foundrymen for years and used to be classified under the all-inclusive terms "slag" and "dirt." In recent years, however, the defect commonly was described by the term "snotter" and presently is referred to variously as the scum defect, ceramic or nonmetallic macroinclusions, and ceroxide. It has been discussed in the literature by G. J. Vingas and J. B. Caine in "Causes and Mechanics of the Scum Defect," FOUNDRY, June, 1959; by R. A. Flinn and L. H. Van Vlack in "Deoxidation Defects in Steel Castings," *Modern Castings*, May, 1959, and by C. A. Sanders in "Casting Finish, Tolerance, Precision," *Transactions*, AFS, 1956.

It seems pretty well established that the defect is caused by a product resulting from the deoxidation of steel. The qualitative analysis you indicate for the inclusions agrees substantially with those given by the several authors mentioned previously. Vingas and Caine state that factors influencing the formation of the scum or inclusions are high pouring temperatures, wet sands, pouring thin sections with the same technique used for larger castings, reladling, overuse of ladles, turbulence and air aspiration promoted by some gating systems, and overexposure of steel to atmospheric oxygen during pouring.

Although those sources point the way to possible remedies, there does not seem to be a definite cure for the problem. Suggestions include not pouring too soon after deoxidation to give time for the inclusions to conglomerate and rise to the top since if they are entrained in the metal stream, they are difficult to trap. Eliminate vortex formation in the sprue by keeping it full; rectangular sprues are less likely to cause vortexing. Use pouring basins so that the steel from the ladle does not enter directly into the sprue. Use runner traps and extensions of the runner past the last gate to catch the inclusions present.

Arrange the gating system so that turbulence is at a minimum. Use of the whirl gate has been suggested as well as placing the runner in the drag and the gates in the cope. Flinn and Van Flack point out that the amount of aluminum or other deoxidant should receive attention, particularly the aluminum, since any excess over that necessary for deoxidation can react with either the mold atmosphere or with the oxygen from the refractories to form additional inclusions.

Vingas and Caine suggest introduction of a neutral atmosphere into the cavity or creation of that condition by additions to the molding sand. They point out that research and experimentation are necessary to develop the latter.

Those suggestions constitute a rather formidable array, and, to make a start, you might look into the gating system. Since you are using bottom-pour ladles you might try use of a pouring basin and possibly rectangular sprues. Again, you might try the whirl gate alone or in combination with the pouring basin. If those do not result in any improvement, you will have to consider the other suggestions—preferably one at a time.

Surface inclusions on steel casting are products of reoxidation reactions

Making Plastic Matchplates

We are trying to secure information on the construction and use of plastic patterns to be produced from master or loose pattern equipment. We do not mean large, "built-up" epoxy patterns, but small work which is converted to plated patterns though application of plastics. Any leads or information will be appreciated.

Although your inquiry is not quite clear, we gather that what you have in mind is to make a pattern plate containing a number of duplicate

patterns from a single master pattern. The procedure is similar to the method employed to make "pressure-cast" aluminum alloy matchplates, and it has been described in the literature a number of times.

Some of the details for producing plastic or resin patterns and plates have been described in several articles in FOUNDRY, including "Casting Patterns in Phenolic Resins," February, 1946; "Matchplate Patterns from Phenolic Casting Resins," November, 1946; "Plastic Patterns," July, 1947; "Plastic Patterns Made by New Process," February, 1948; "Matchplates Made from Plastic," August, 1948; and, more recently, in "How To Make Plastic Steel Patterns," March, 1958.

Briefly, the first step is to make the required number of "piece" molds in plaster or the plastic. If the pattern is split, it is placed on a board after it has been coated with a suitable release agent and is surrounded by a suitable, separable wood flask, usually formed of two L-shaped pieces which are clamped together. Plaster or plastic is poured around the pattern. With solid patterns, a follow board arrangement to establish the parting line must be used.

After the required number of piece molds has been made, they are placed face-down, preferably on a heavy, glass-topped table, although occasionally a smooth board can be used. The molds are located, of course, so that they will provide the proper pattern arrangement. Then they are surrounded by a suitable flask similar to that mentioned earlier. Dimensions of the flask are such that they will encompass the desired plate size. Since the molds may tend to move, some arrangement must be made to hold them down—by weights or other means. Plaster then is poured around them to form an integral mass which will form the drag.

When the plaster has set, the flask is removed, and the plaster structure is rolled over so that the face is up. Since the plaster still is moist, the gating system can be tooled into the surface or the surface can be left flat and a separately tooled gating system mounted on the resulting plate. If a single face plate is to be made, a plaster flatback of the proper dimensions is made with a sprue hole to admit liquid plastic.

In many instances, a special metal frame to form the outside contour of the plate is used and is placed over the plaster drag mold in the proper position. The metal frame forms part of the plate. Faces of the mold and the cavities are coated with a heat-resistant lacquer. The face of the flatback also is coated with the same material and clamped in place over the drag containing the metal frame. Then the liquid plastic is poured into the sprue opening.

The pattern sections can be lightened by suspending suitable wood cores in the cavities so that they become part of the assembly or by use of plaster or modeling clay cores. The latter are arranged so that they can be removed and will leave the patterns hollow.

If a double-faced plate is under consideration, additional steps will have to be made. One is to make the other half-piece mold in plaster so that replicas of the full pattern can be produced. These are inserted in the cavities in the drag mold, the assembly is coated with release agent, and the whole is invested with plaster to form a cope mold. After that sets, it is removed, the plaster dummy patterns are removed from the drag, and then the cope mold placed over the drag after placing the metal frame in position. Opening between the two molds is filled with the resin.

Method for Coloring Bronze

Can you give us any information on a chemical used for oxidizing bronze tablets and plaques?

Material in general use for obtaining a light brown to almost black color on copper-base alloys is a solution of ammonium polysulfide in water. The color obtained will depend on dilution and time of immersion. Strong solutions develop the color more rapidly, but the weak solutions, although requiring a longer time for developing the color, give better results due to a denser film being formed.

Ammonium polysulfide is a liquid and may be obtained from any chemical supply house furnishing materials to laboratories or to electroplating establishments.

Must Consider Many Factors Before Changing Molding Method

We operate a small foundry producing cast iron soil pipe and fittings and want to change our method to centrifugal casting or permanent mold process. Have you any suggestions?

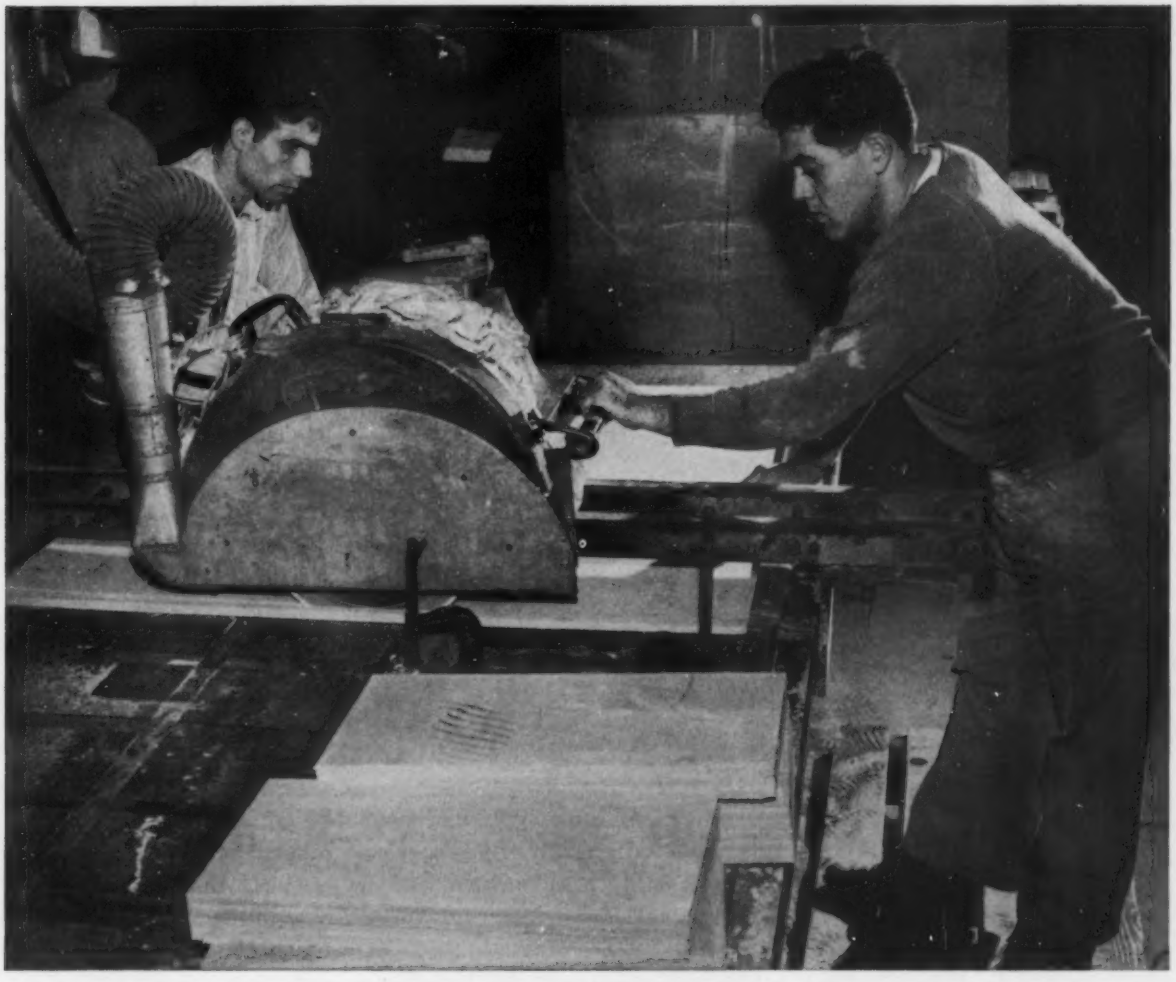
In response to your remarks in desiring to change your present method of making soil pipe, presumably by hand in green sand, to production by centrifugal casting or permanent molding, we might point out that as far as we know, the permanent mold process is not used for soil pipe. By the permanent mold process we mean using metal molds, sand cores, and gravity pouring of the molten metal.

In the centrifugal process, metal molds with or without a sand lining are used. The molds are rotated on a horizontal axis, and the molten metal is poured in while they are spinning. No cores are used since the rotation of the mold forces the metal to the mold wall and forms a hollow tube.

As might be expected, centrifugal casting machines are designed for high production rates, and are relatively expensive. To make such equipment pay for itself in a reasonable period of time, it is necessary to keep it operating at or near capacity every working hour.

It seems to us that before changing your method of manufacture, you should determine the market—the number of pipe you actually would be able to sell. It hardly seems necessary to point out that you should not produce more than you can sell. Then determine how much it costs to produce that quantity of pipe by your present method, taking into consideration all the cost factors.

With that information on hand, and information on cost of centrifugal casting equipment, operating costs, and rate of production obtained from the makers of such equipment, you can determine which is the more economical to use to produce the required number of pipe. Names and addresses of makers of centrifugal casting equipment may be found in the advertising section.



Now...new, light-weight **TRANSITE® CORE PLATES** can be field-cut and shipped promptly to you!

Johns-Manville Research Engineers have now developed a new light-weight Transite Core Plate sheet stock which makes it possible for this sturdy asbestos-cement board to be cut locally by an authorized J-M cutter-rehandler and shipped to you promptly without further factory processing.

This quick service eliminates the danger of costly production delays due to slow deliveries. And the lighter weight means lower freight costs, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. Extremely strong, they resist shock and corrosion, will not crack or break under normal use. They maintain their smooth, level surface year after year with a minimum of wear.

FREE FOLDER GIVES COMPLETE DETAILS

Whether or not you now use Transite Core Plates, there are many rewards to be had from a careful study of J-M folder IN-219A. It gives complete specifications on weights, sizes and thicknesses. And, for the address of your local authorized J-M cutter-rehandler, write Johns-Manville, Box 14, New York 16, New York. In Canada: Johns-Manville, Ltd., Port Credit, Ontario. Cable address: Johnmanvil.

JOHNS-MANVILLE JM

Johns-Manville, Box 14, New York 16, N. Y.
(In Canada: Port Credit, Ontario)

Please send me booklet IN-219A at no cost or obligation to me.

NAME_____ TITLE_____

FIRM_____

STREET ADDRESS_____

CITY_____ ZONE_____

COUNTY_____ STATE_____

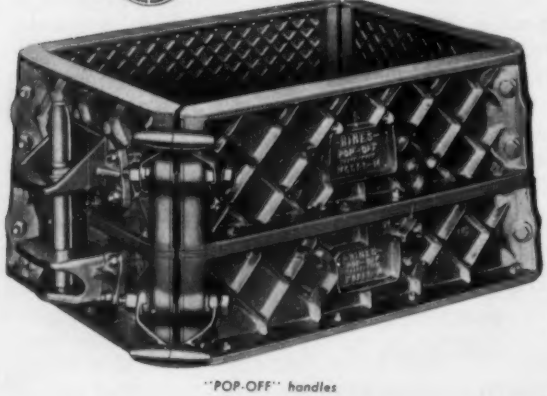
HOLD 'EM DOWN!

MOLDING COSTS

It's an established fact that you need good equipment to turn out good molds — economically. And there's no other type of foundry equipment you might invest in that will pay bigger dividends than HINES "POP-OFF" flasks. These exceptionally efficient flasks will hold your molding costs to a minimum by producing an unusually high percentage of perfect molds and, conversely, less scrap.

Fixture-built to extreme accuracy, reinforced at the parting line and buttressed with the familiar diagonal ribs, HINES "POP-OFF" flasks are built to outperform and outlast any other flask on the market. They last longer, too, because hammering isn't necessary for removal — just move the "POP-OFF" levers and off they come!

HINES POP-OFF FLASK FEMA



"POP-OFF" handles in "open" position

"POP-OFF"—®

Made in standard, medium and heavy-duty weights, sizes to 36" by 48". Trunnions, handles, reinforcing pipe, pin arrangement to your requirements. If you want the best, the most economical flasks on the market — get in touch with us for our recommendation.

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3431 WEST 140th STREET • CLEVELAND 11, OHIO

ORchard 1-2806

HINES FLASKS

New EQUIPMENT and SUPPLIES

For More Information, Use Reader Service Card—Page 39

CORE TRUCK

Multiple shelf core truck is to be used for conveying cores in the coreroom or for delivering them to the foundry via lift truck. Each shelf is mounted on coil springs, and unit can be furnished with or

without pneumatic tires. Customer specifications are followed for overall dimensions, number of shelves, and load capacity.—**Arco Welding Service**, 4727 S. Hoyne Ave., Chicago, Ill.

For More Details Circle No. 451—Page 39

LARGE ZINC PIGS

Large zinc pigs weigh 2500 lb and measure 36 x 28 x 16 in. They are designed with legs and wings under which lift truck prongs may be

placed in either direction for transportation. Tapered holes in the top of the pig can be used for moving with crane hoist tongs as shown. Large pigs are said to reduce loading and handling costs.—**New Jersey Zinc Co.**, 160 Front St., New York 38, N. Y.

For More Details Circle No. 452—Page 39

BUCKET CONVEYOR

Continuous bucket conveyor combined with a vibrating feeder is claimed to allow feeding materials at a more constant rate. Standard buckets are 4 and 8-in. standard pitch in sizes up to 36 in. wide in 6-in. increments. They are made of steel plate up to 3/16 in. thick.—**Conveyor Corp.**, 19815 E. Nine Mile Rd., St. Clair Shores, Mich.

For More Details Circle No. 453—Page 39

ABRASIVE PRODUCTS

Line of Crownflex abrasive products includes grinding discs and

cutoff wheels for use on portable grinders and cutoff wheels and offset grinding wheels for use on swing frame grinders. Illustration shows a grinding disc mounted on an electric portable grinder. Products are for use at high surface speeds and are said to provide safety and long life.—**American Crownflex Abrasive Wheel Mfg. Corp.**, P. O. Box 123, Riverside, N. J.

For More Details Circle No. 454—Page 39

ULTRASONIC TESTER

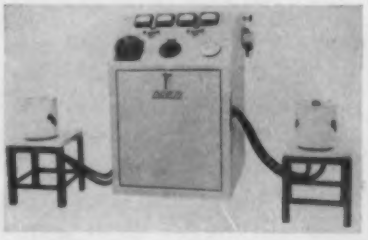
Model 424-D Immerscope is for ultrasonic nondestructive testing of castings as well as other structures. Built-in facilities provide for high sensitivity, high resolution contact testing and include an automatic flaw alarm circuit. Pulse repetition rate is variable and the built-in recorder output circuits can be connected directly to company's re-

corders. A built-in video delay circuit is included.—**Princeton Div., Curtiss-Wright Corp.**, P. O. Box 110, Princeton, N. J.

For More Details Circle No. 455—Page 39

CONTROL UNIT

Control unit for high-frequency induction heating and melting, Integral 15, is powered by a motor-generator set and is rated at 15 kw. It is designed for potential replacement of company's line of 20 kw, spark-gap control units. Advantages claimed include lower maintenance, more efficient power utilization, and greater operating continuity. Arcing problems are re-

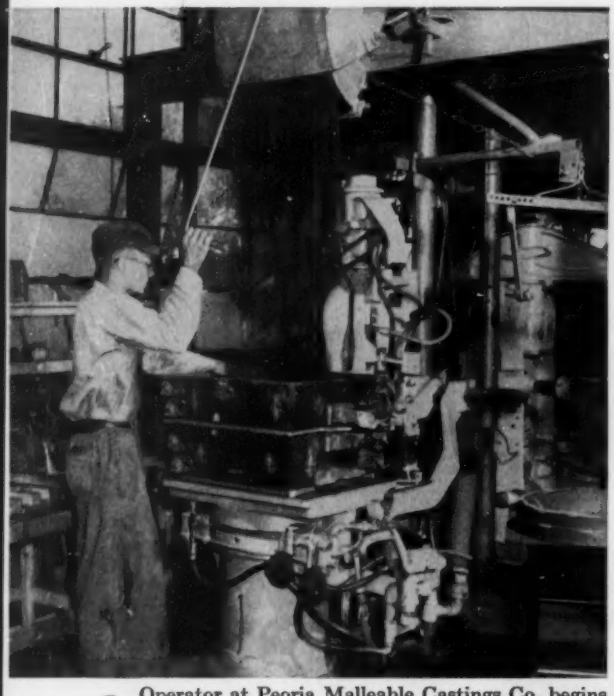


duced 99 per cent so that vacuum melting is possible and the need for periodic replacement of mica coil insulation is eliminated.

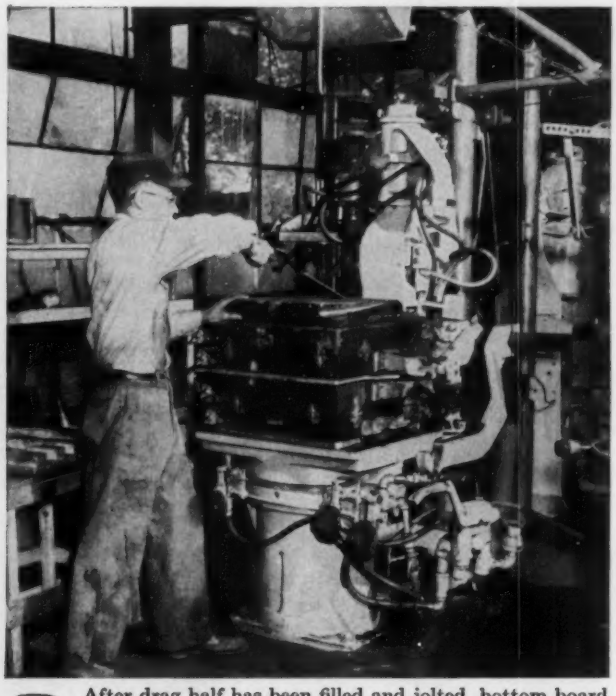
The self-contained console in-

Peoria Malleable Castings Company shows you . . .

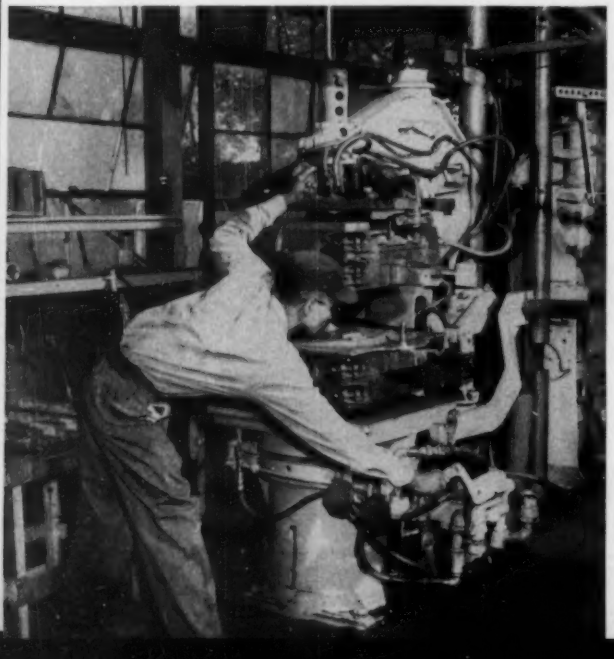
HOW ROTA-LIFT® RAMS LARGE



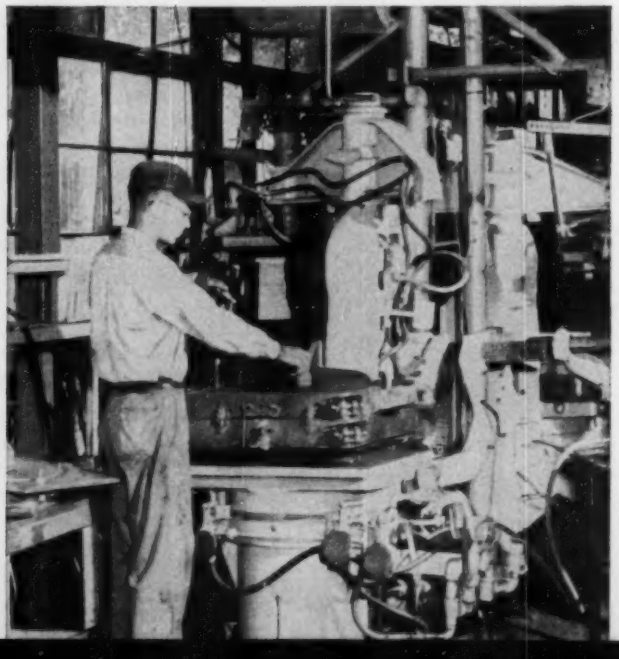
1 Operator at Peoria Malleable Castings Co. begins molding cycle with assembled flask and pattern plate on *Rota-Lift* table. Drag is filled with sand from overhead hopper.



2 After drag half has been filled and jolted, bottom board is secured and flask is ready for lift and rollover. Unit in background is another of the nine *Rota-Lift* machines used here.



4 *Rota-Lift* squeezes cope and drag, draws and holds cope on return stroke. Pattern plate is vibrated during draw. Operator draws pattern prior to setting cores.

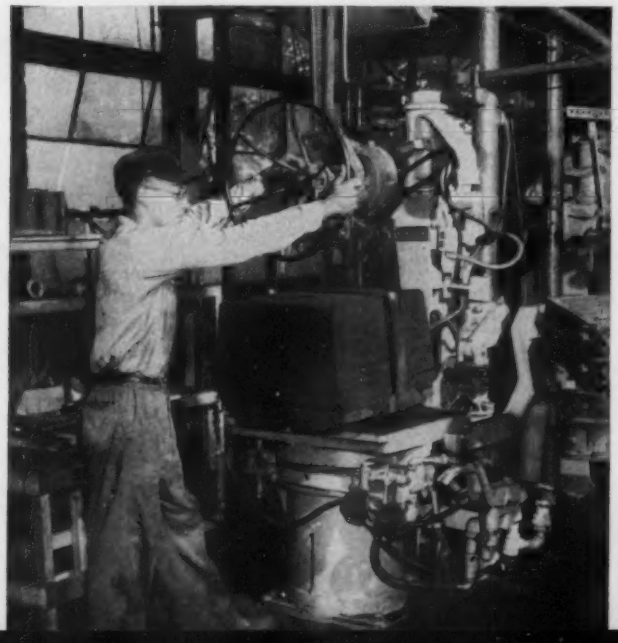


5 Cope is now swung out of the way at left. Operator sets cores, positions head of *Rota-Lift* over drag and machine closes the mold.

MOLDS FASTER AT LESS COST

3 Operator hits knee-operated valve, *Rota-Lift* arms raise flask for quick, easy rollover. Rolling action is guided with fingertips. No heavy muscle-work needed.

6 Flask is manually stripped and finished mold—ready for pouring—is lowered to floor by jib-crane. **Rota-Lift lets operator complete entire molding cycle in less than two minutes.**



Mechanized match-plate molding saves time . . . muscle . . . money . . . in this modern jobbing foundry

Like many jobbing and semi-production foundries today, Peoria Malleable Castings Company looked hard for ways to upgrade efficiency and reduce costs on short-run, match-plate molding operations.

Multiple Problem—They needed the answers to questions like these: How can we cut pattern change-over time? How can we speed mold making and handling? How can we keep up production continuity on small job-orders for our wide product range? They found the answers in Osborn *Rota-Lift* equipment.

Today, Peoria Malleable operates nine *Rota-Lift* machines at their up-to-date Peoria, Illinois plant. It's on-the-job proof that where profitable runs depend on speed and economical operation, it pays to mechanize with *Rota-Lift*.

One-Man Job—Rota-Lift easily does all five major match-plate molding operations . . . jolt . . . roll . . . squeeze . . . draw . . . close. Peoria Malleable found that a single *Rota-Lift* operator can handle the entire molding operation from fill to strip, turning out a finished mold about every two minutes. And *Rota-Lift* machines are quickly adjustable to a wide range of flask sizes for fast job change-overs.

Over-All Costs Down—Work-loss and costs due to injuries are lower, too—because *Rota-Lift* takes the "muscle" out of large match-plate molding. It handles all the heavy lifting . . . eliminates manual rollover.

If you're looking for a way to streamline your molding operations . . . improve your competitive position . . . increase your profit margin—Osborn can recommend the right model *Rota-Lift* to do the job. Write for full details. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

Foreign Representatives—*ARGENTINA: EISA Argentina, Buenos Aires. BELGIUM: S. A. Isbecque Todd, Brussels. BRAZIL: Equipamentos Industrias EISA, Ltd., Sao Paulo. BRITISH ISLES: J. W. Jackman & Company, Ltd., Manchester. FRANCE, ITALY: S. A. des Machines Osborn, Paris. MEXICO: Forel de Mexico, S. A., Mexico, D. F. THE NETHERLANDS: Landre & Glinderman, NV, Amsterdam. SWEDEN: S. Alexanderson & Company, A/B, Sodertalje. SWITZERLAND, FED. REP. OF GERMANY: APROTEC, S. A., Geneva. BOLIVIA: International Machinery Co., LaPaz. CHILE: International Machinery Co., Santiago. PERU: International Machinery Co., Lima.*

OSBORN

Molding Machines • Shell Core Machines • Core Blowers • Metal Finishing Machines ...and Finishing Methods • Industrial Brushes

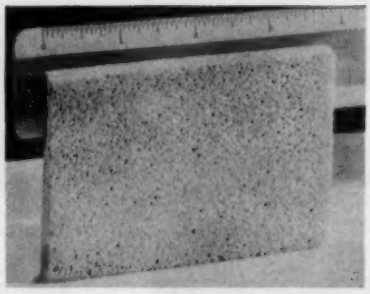
For More Information Circle 593, Page 39

cludes everything necessary for operation of either of two induction melting furnaces or coils, and it can be moved to any location where proper power and water connections are available.—**Inductotherm Corp.**, 412 Illinois Ave., Delanco, N. J.

For More Details Circle No. 456—Page 39

CERAMIC INSULATING BRICK

Ceramic insulating brick is claimed to withstand temperatures to 4200° F. It is formed in standard brick sizes of 2½ x 4½ x 9 in. Material has a mean thermal conductivity of less than 1.0 at 2200° F. With a porosity of 89 per cent, each brick weighs about 2 lb. Temperature limits are 4200° F in nitrogen, hydrogen or oxidizing atmospheres or in



a vacuum; 3000° F in contact with SiO_2 or Al_2O_3 or in a reducing atmosphere; and 2200° F in contact with SiC. Material can be cut, sawed, or filed readily.—**Ipsen Industries Inc.**, P. O. Box 500, Rockford, Ill.

For More Details Circle No. 457—Page 39

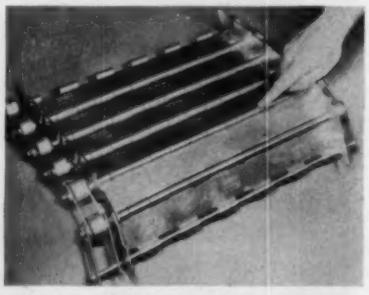
BAND SAW BLADE

Band saw blade is available in standard tooth, skip tooth, and gored tooth designs. High speed cutting is possible because the blade will withstand temperatures up to 1100° F without softening, and the blade can be used to cut steel. It comes in ¾ and 1-in. widths and is welded to lengths specified by the purchaser. —**Victor Saw Works Inc.**, Middletown, N. Y.

For More Details Circle No. 458—Page 39

HINGED STEEL BELTING

Hinged belting is fabricated from ⅛-in. steel in 2½-in. links. Short links allow belt to run on sprockets



with a pitch diameter as small as 5 in. As a result, over-all conveyor depth can be as little as 8½ in. Individual links are produced in widths up to 18 in., and belts wider than 18 in. can be assembled from multiple links. Belting is used to carry heavy castings, even in applications such as water quenching or conveying hot metal parts.—**May-Fran Mfg. Co.**, division of Fischer & Associates Inc., 1710 Clarkstone Rd., Cleveland 12, Ohio.

For More Details Circle No. 459—Page 39

ALUMINUM CLEANER

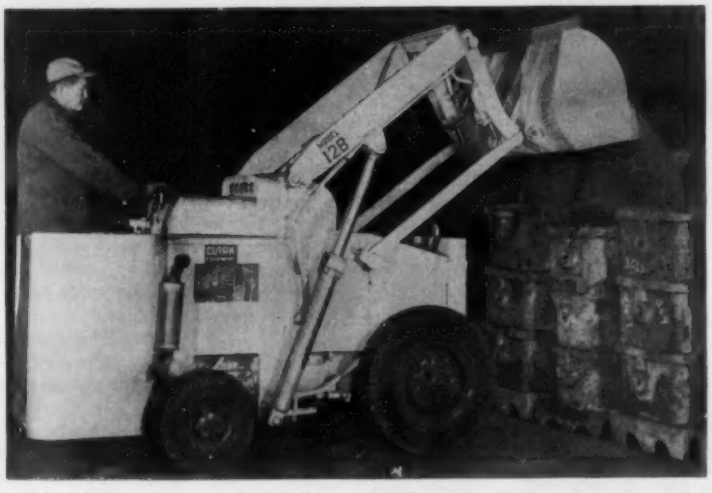
Cleaning preparation is said to be safe for cleaning aluminum and all types of aluminum finish. Called Formula 399, it removes grease, oil, tar, wax, waterspots, and fingermarks. It is noninflammable and is claimed not to dry the skin. Preparation comes in 30-gal drums, 5-gal cans, and 1-gal cans.—**Time Tested Products Inc.**, 224 East Olive, Los Angeles, Calif.

For More Details Circle No. 460—Page 39

GRINDING WHEEL DRESSER

Grinding wheel dresser has a double cutter unit for dressing and truing straight-faced grinding wheels used on flexible shaft and portable grinders. Wheels from 4 to 8 in. in diam can be dressed without being removed from their spindles.

Tractor Shovel Incorporates Standup Control



Model 12B tractor shovel features standup control enabling operator to mount and dismount quickly. Lifting capacity is 3520 lb with a variety of buckets ranging from 13 cu ft to 1 cu yd in capacity and from 42 to 62 in. wide. Accessory equipment includes mounting plate for stoking ram, special buckets, fork lifts, bucket teeth, and flame and spark-arresting equipment.

Maximum forward speeds are 5.6 mph in first gear and 11.2 in second. Top reverse speed is 10.5 mph. Unit is powered by a 42-hp diesel engine and the drive line features 3 to 1 multiplication, industrial-type torque converter, power shift transmission, and spiral bevel gear and pinion drive axle with planetary reduction in the wheels. Total machine weight is 6470 lb. Hydraulic system features a pump rated at 12 gpm.—**Construction Machinery Div., Clark Equipment Co.**, Pipestone Plant, Benton Harbor, Mich.

For More Details Circle No. 482—Page 39

Circle 594 on Page 39→

"I'LL TAKE A MILLION TONS..."

Wish he would stop bothering us! Tempting as it is to receive such a big order from the Otherworld's No. 1 Heating Expert — we've got a firm policy to sell only *good* guys.

The nice thing about this policy is when we sell the good guys (and we've been selling a lot of 'em lately) they stay sold and remain good customers of ours forever.

The reasons? Koppers Coke is made from top-quality West Virginia coals; skillfully blended and baked the right amount of time. It's absolutely uniform in *size, strength, structure* and *chemical analysis*. We test every day's run to be sure.

Because of its superior physical qualities, high carbon and low ash, Koppers Coke enables you to maintain higher temperatures which increases the cleanliness of the iron and helps reduce fuel consumption.

Why not make your next order Koppers Premium Foundry Coke? It's available anywhere in the U.S. or Canada in sizes to fit your needs. P.S. Your initial order needn't be for a million tons. Anything from a carload up will be fine. Koppers Company, Inc., Pittsburgh, Pennsylvania.

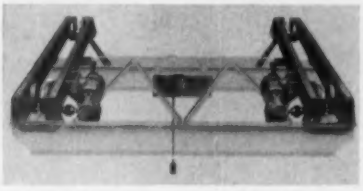
Koppers Premium Foundry Coke

Unit is 2¾ in high with a base 7 in. long by 3¼ in. wide. It weighs 6 lb and can be bolted or screwed on a bench or other flat surface.—**Desmond-Stephan Mfg. Co.**, Urbana, Ohio.

For More Details Circle No. 461—Page 39

MOTORIZED CRANE KIT

Crane kit components are for building cranes at time of erection with locally purchased structural beams. Kits for top-running and under-running types include precision aligned individually driven end trucks, controls, instructions, and mounting details. Sizes avail-

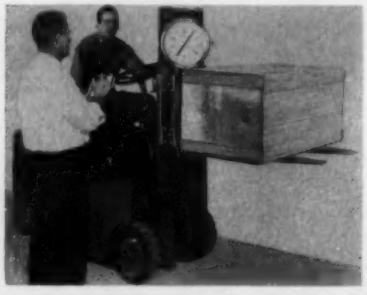


able include capacities up to 6 tons and spans up to 40 ft. Bridge speeds range from 50 to 140 fpm and include adjustable ballast resistor controls for smooth acceleration.—**Cleveland Beacon Products Co.**, 860 Addison Rd., Cleveland 3, Ohio.

For More Details Circle No. 462—Page 39

FORK LIFT SCALE

Hydraulic scale can be installed on any make of fork lift truck. It is a self-contained hydraulic com-

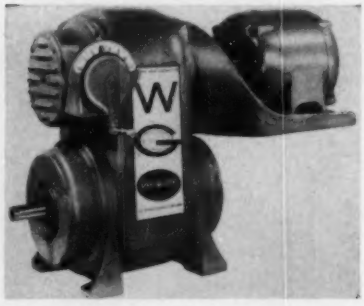


pression cell-type unit available in models with scale capacities ranging from 1000 to 6000 lb. Dials on all models are 12 in. in diam. and are protected with tempered safety glass. Tare adjusting knob is provided on all models so that stock containers and pallets can be tared out up to 20 per cent of scale capacity. Scale is said to be accurate to within 0.50 per cent of scale capacity. It can be rotated 180 degrees and can be made inoperative by turning a lockout knob.—**Hydroway Scales Inc.**, 31302 Stephenson Highway, Madison Heights, Mich.

For More Details Circle No. 463—Page 39

VARIABLE SPEED DRIVE

Mechanical variable-speed drive is available in three sizes covering range from 1 to 10 hp and range of speed variation up to 8-to-1 ratio. Unit is provided with a standard NEMA motor of drip-proof, totally enclosed, or explosion-proof design. A fan on the variable speed shaft is said to allow maximum cooling of the belt. Helical gear reducer is offered in double, triple, and quad-



ruple-step reduction. Unit can be equipped with manual (handwheel) control, electric remote (pushbutton) control, or pneumatic automatic control, and a variety of speed-indicating tachometers are available.—**Industrial Products Div., Western Gear Corp.**, P. O. Box 182, Lynwood, Calif.

For More Details Circle No. 464—Page 39

EPOXY ADHESIVE

Epoxy adhesive is said to cure in 60 seconds at room temperature, and curing time can be accelerated by infrared lamps. Adhesive is claimed to be useful in applications where solder has been used for assembly. The resin-hardener system can be used in automatic metering-mixing-dispensing units for rapid production line work.—**Allaco Products**, 238 Main St., Cambridge 42, Mass.

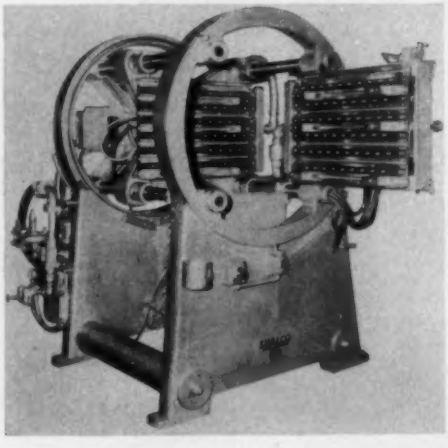
For More Details Circle No. 465—Page 39

ZINC DIECASTING ALLOY

Zinc-base diecasting alloy is said to have improved casting properties. Known as ASARCO No. 7 alloy, it has a low but controlled magnesium content. Mechanical properties are similar to those of other standard

Shell Coreblower Features Power Rollover

Semiautomatic shell coreblower, Model U-180-M, sequences automatically through control of preset timers. Power rollover is incorporated so that only a few manual operations, such as corebox opening and closing, are required in each cycle.



Unit occupies an area 8 ft square and accommodates coreboxes up to 27 x 20 in. with maximum depth of 15 in. Either gas or electric heating is available to heat the coreboxes. Integral sand hopper holds 150 lb of sand. One man can operate more than one machine, and for this purpose, right and lefthand models are available.

Optional auxiliary attachments offered include automatic sand feed, internal gas hot air cure, top and side draw attachments, and mechanical ejection.—**Shalco Div., National Acme Co.**, 170 E. 131st St., Cleveland 8, Ohio.

For More Details Circle No. 483—Page 39

Operation: Blast Cleaning

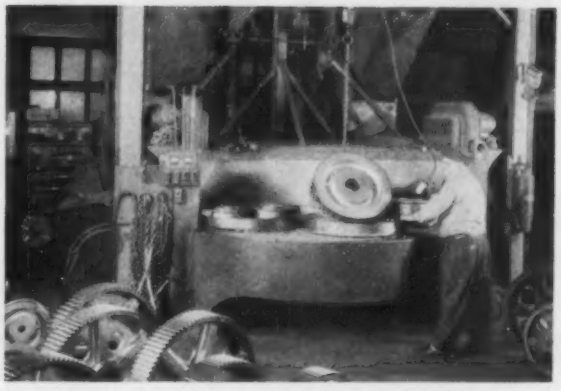
(one of a series)

THIS CASTING TOOK
15 MINUTES TO CLEAN . . .

THIS ONE ONLY 4 MINUTES
WITH **ROTOBLAST**

No two ways about it: Rotoblast equipment cuts cleaning costs, sometimes by as much as 70%. Hundreds of manufacturers have improved their profit picture — as well as their quality of cleaning — with Rotoblast because it reduces manpower—up to 75% . . . works faster, up to 50% faster for straight through processing ...requires much less maintenance... reduces down-time.

Whether it is a small Rotoblast barrel or a giant tableroom, you'll find that the day you start using Rotoblast is the day your cleaning costs start to come down. And you'll get additional cleaning economies with the use of solid, tough, Rotoblast Steel Shot and Grit. To get the full story, write:



Pangborn
OF HAGERSTOWN

PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.; Pangborn Canada Ltd., 38A Mattson Rd., Toronto, Ontario; —Manufacturers of Blast Cleaning, Vibratory Finishing, Dust Control Equipment—Rotoblast® Steel Shot and Grit®.

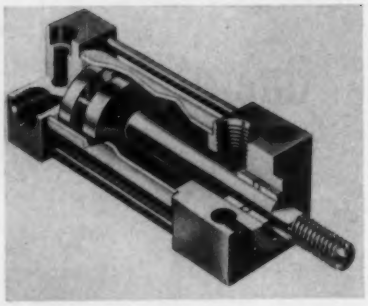
For More Information Circle 595, Page 39

zinc diecasting alloys, but casting properties are improved, permitting faster production rates, fewer rejects, and better surface finish. Alloy is claimed to permit diecasting of larger, more complex castings with thinner wall sections. Lower casting temperatures increase die life.—**Federated Metals Div., American Smelting and Refining Co.,** 120 Broadway, New York 5, N. Y.

For More Details Circle No. 466—Page 39

COMPACT AIR CYLINDER

Air cylinder is compact, yet has maximum operating pressure of 200 psi. It is available in ¾, 1, and 1⅛-in. bore sizes with standard strokes ranging to 12 in. in either double-acting or spring-return models. Piston and piston rod are brazed to prevent loosening during operation. O-ring seal normally is



fitted, and special seals can be provided if working temperatures exceed 165° F. Four basic mountings can be used with optional clevis and flange also available.—**Hannifin Co.,** Dept. 238, 501 S. Wolf Rd., Des Plaines, Ill.

For More Details Circle No. 467—Page 39

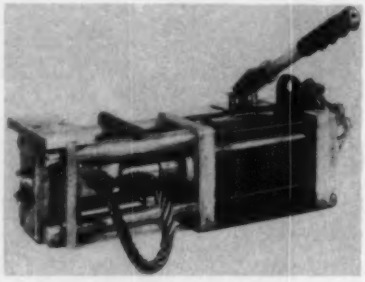
DIECASTING QUENCH

Diecasting quenching compound is claimed to eliminate scumming, foul odor, chip and dirt flotation, and blistering rejects due to water corrosion. Material is usable for aluminum and zinc diecastings and leaves only a thin residue—not enough to affect gaging. Residue is water repellent and is said to prevent oxidation for as long as three months. Cleaning of castings prior to plating also is simplified. — **Northwest Chemical Co.,** Roselawn Avenue, Detroit, Mich.

For More Details Circle No. 468—Page 39

CABLE PROCESSING PRESS

Portable hydraulic press was developed to cut cable and to make slings, eyes, chokers, and splices at the job site. Changeover from



cutting to processing operation is accomplished by reversing an end plate to the pressure side and inserting a pressure arbor in place of a cutting arbor. Typical processing operation consists of placing a sleeve on the cable, inserting the cable end in the sleeve, and positioning the sleeve at the pressure slot on the end plate. Pressing the lever moves the pressure arbor so it compresses the sleeve and cable into a single unit. Cutting is also a simple operation, and unit is said to cut without leaving jagged or frayed ends.—**Mark Naught Inc.,** 322 Lumbermen's Bldg., Portland 4, Oreg.

For More Details Circle No. 469—Page 39

AIR MAKE-UP UNITS

Air make-up units are designed for use wherever outside air must be brought inside a plant to replace air exhausted in processing operations. Each unit consists of a galvanized sheet metal enclosure, approximately 7 ft high x 7 ft wide x 8 ft long. One end of the unit fits an outside wall opening and is equipped with intake louvers, birds screens, and shutdown dampers. Other end is equipped with a fan which draws in outside air. A gas burner, which burns natural

Turntable Facilitates Gas Cutting of Risers

Turntable is designed for mounting large castings to facilitate removal of risers by gas cutting. Four-ft turntable has a capacity of 5 tons, and its peripheral speed can be controlled to between 2 and 20 in. per min. To accomplish the cutting, a gas torch is clamped in a stationary position and the casting revolves past it.

The driving pinion has a quick-disconnect feature to permit the operator to revolve the turntable manually to any position. Advantages claimed for the turntable over manual cutting include smoother, more consistent cuts and allowance for right amount of finishing material, which reduces the required machining time. — **Macton Machinery Co.,** Stamford, Conn.

For More Details Circle No. 484—Page 39

FOR NEW IDEAS IN

HEATING AND MELTING BY INDUCTION...

The complete line of furnaces for die casting includes: Single Hearth Holders; Single or Double Hearth Ajaxomatics for automatic pouring; Double Hearth Melters and Holders for hand ladling.

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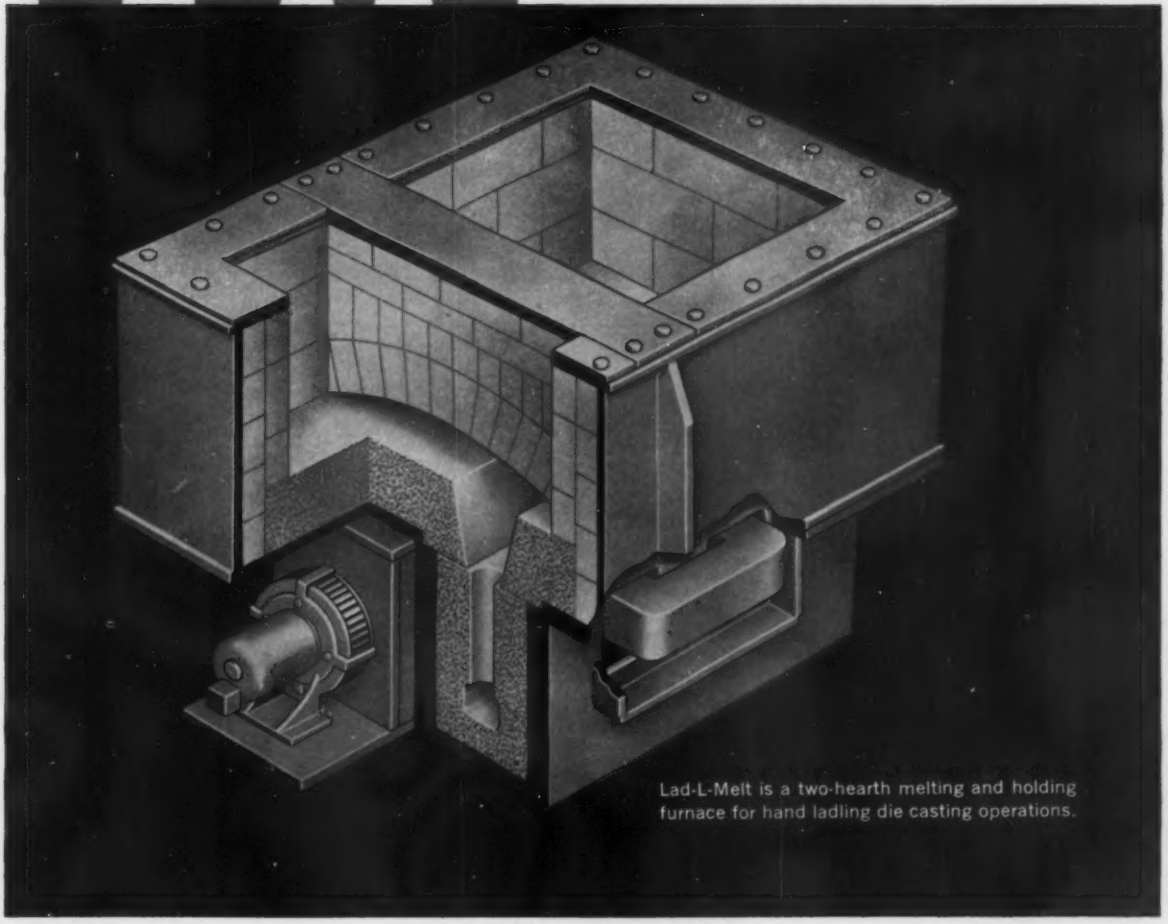


Lad-L-Melt is a two-hearth melting and holding furnace for hand ladling die casting operations.

or manufactured gas and is equipped with safety controls, heats incoming air. Units are available in seven models to supply air at rates from 20,000 to 80,000 cfm. —**J. O. Ross Engineering Div., Midland-Ross Corp.**, 730 Third Ave., New York 16, N. Y.

For More Details Circle No. 470—Page 39

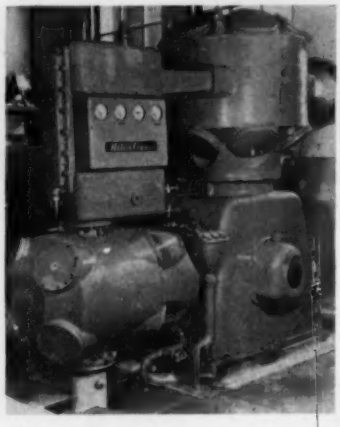
PLASTIC FILLER

Polyester resin plastic is said to adhere firmly to metal, wood, plastic, and other materials. It will not corrode, shrink, flake, chip, or peel and is flexible enough to withstand heavy vibration without loosening or cracking. It works like putty and hardens in 5 to 7 minutes at room temperature. Uses claimed for this material include forming or repairing small molds and dies and filling rough spots in castings.—**Magic Iron Cement Co.**, Cleveland 28, Ohio.

For More Details Circle No. 471—Page 39

AIR COMPRESSOR

Stationary air compressor, Model ERB, is rated at 400 hp and delivers 2280 cu ft of air per minute at 100

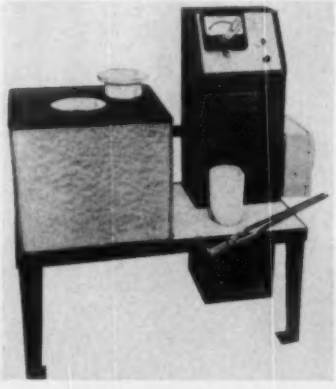


psi when running at 514 rpm. Unit is a two-stage, double-acting, water-cooled type with cylinders in an L-arrangement. Rated output is 125 psi. Weight is 11,700 lb and unit is 94½ in. wide, 63½ in. deep, and 93½ in. tall. Unit is delivered ready to install by bolting to a steel frame preset in a concrete foundation.—**Atlas Copco**, 545 Fifth Ave., New York 17, N. Y.

For More Details Circle No. 472—Page 39

RESISTANCE FURNACE

Resistance furnace is useful for melting and heat treating in the laboratory at any temperature up to 2300° F. Heating element is heavy Kanthal wire operating at 40 v and can be replaced easily. Automatic temperature controller maintains heat element at safe operating temperature so that after loading the furnace requires no attention. Furnace is supplied with a high-conductivity crucible. A ceramic sump under the crucible acts



as a catch basin in event of crucible breakages. Unit can melt 5 lb bronze in 30 min. Over-all, unit is 35 in. high, 33 in. wide, and 14 in. deep. It is supplied for operation on 115, 208, 220, or 230 v ac.—**Jelrus Technical Products Corp.**, 615 W. 131st St., New York 27, N. Y.

For More Details Circle No. 473—Page 39

ZINC DIECASTING MACHINE

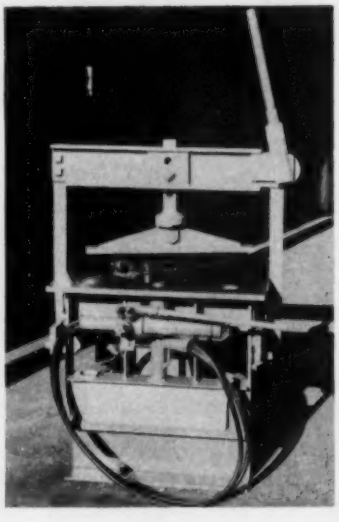
Automatic zinc diecasting machine features a sensitive pressure switch in series with a wide-tolerance microswitch which feels foreign matter, flash, or a stuck casting between the dies as they lock up. Any unejected casting or foreign matter causes the die to retract and stop the cycle. Recycling occurs after a brush device has cleared the obstruction. Automatic operation permits up to 1500 shots per hour while the operator tends four or more machines.

Other features are tool steel tie bars, automatic die temperature control, automatic die cleaning and

Hydraulic Press Salvages Foundry Flasks

Hydraulic press designed to straighten bent flasks is constructed of heavy, hot-rolled steel throughout and is composed of a machined surface plate supported by a structural base, a clamp, and a ram actuated by a hydraulic cylinder. Surface plate permits checking of sand joints on both copes and drags. Clamp adjusts to any flask depth and the clamp carriage, mounted on ball bearing rollers, moves easily forward and backward to accommodate the full width of a flask.

Hydraulic cylinder is manually operated and the ram can be located in three or more positions, depending on the model, as illustrated here. Standard ram force is 10 tons, but a special cylinder is available for 20 tons force to straighten heavy steel flasks. These rams can be used to replace worn pins in addition to straightening. A hydraulic tool is provided to reshape bent flasks and to adjust pin centers.



Four standard units take flasks from 20 x 30 in. up to 44 x 66 in., and larger capacities are available on special order.—**Claude B. Schneible Co.**, P. O. Box 296, Roosevelt Park Annex, Detroit 32, Mich.

For More Details Circle No. 485—Page 39

International Automation Corporation presents

THE NEW TRIED AND PROVEN "BUHRER" SAND COOLER

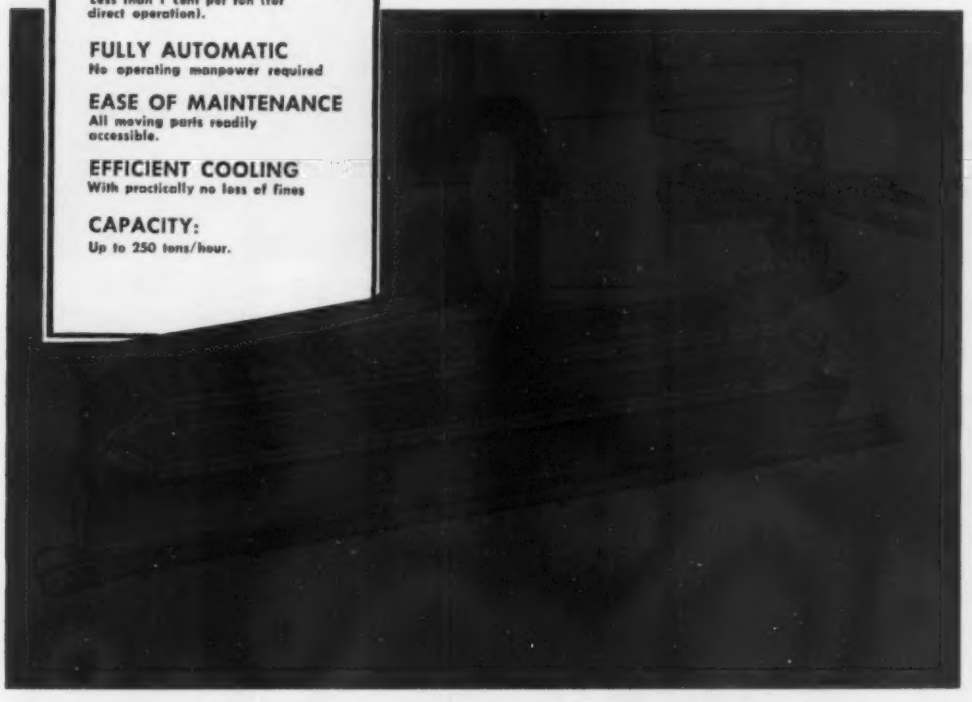
LOW COST OPERATION
Less than 1 cent per ton (for direct operation).

FULLY AUTOMATIC
No operating manpower required

EASE OF MAINTENANCE
All moving parts readily accessible.

EFFICIENT COOLING
With practically no loss of fines

CAPACITY:
Up to 250 tons/hour.



Save by reducing casting defects.

Save by reducing the use of parting agents.

No loss of "Fines".

No loss of re-usable binder.

Save on binder additions.

Much better control of sand properties at the mill and at the molding stations.

Save on maintenance cost.

Better working conditions.

Perfect control of molding sand properties is an absolute necessity for any successful molding operation.

Strength, permeability, flowability, etc., must be accurately controlled in the mixing unit and, equally important, these properties must be stable to insure uniformity at the molding stations.

Only the use of a cool sand guarantees stability. Variations in sand properties, caused by varying evaporation of the moisture, are eliminated.

The use of hot molding sand not only causes control loss of sand properties at the molding stations, but is also directly responsible for many casting defects.

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For More Information Circle 597, Page 39

lubricating mechanism, platen speed control, and an automatic-ladling preheat furnace.—**DCMT Sales Corp.**, division of British Industries Corp., Port Washington, N. Y.

For More Details Circle No. 474—Page 39

SANDBLAST NOZZLE

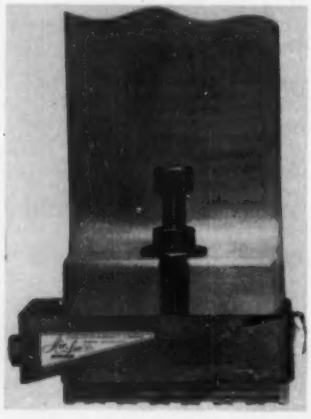
Ceramic sand blast nozzle fits B-type holders. A flare in the base

of the nozzle eliminates metal flange formerly required. New construction is claimed to provide tighter closure with the nozzle, easier replacement, and longer, more even wear because of better alignment. Material used for the nozzle is said to be second in hardness only to diamond. This hardness results in long service life, and high strength practically ends breakage.—**Diamonite Products Mfg. Co.**, Shreve, Ohio.

For More Details Circle No. 475—Page 39

LEVELING MACHINERY MOUNT

Mount is designed to be bolted to any machine for leveling and for



controlling vibration. Adjusting bolt permits mount to be used for leveling the machine. When mounts are bolted on, machine can be moved from one position to another.—**Clark-Cutler-McDermott Co.**, Franklin, Mass.

For More Details Circle No. 476—Page 39

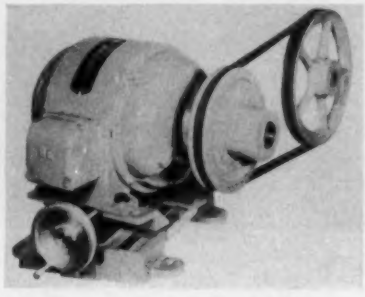
AXIAL FLOW FANS

Fans for general ventilation, dust and fume removal, and similar services are offered in both direct-driven and belt-driven vane axial types. Capacities at zero static pressure range from 3220 to 72,500 cfm. Features include airfoil fan wheels, flanged fan casings, and sealed self-aligning bearings. A complete choice of motor types is available.—**L. J. Wing Co.**, Linden, N. J.

For More Details Circle No. 477—Page 39

ADJUSTABLE MOTOR BASES

Motor bases are available in two models, MB-11 and MB-12, for use with company's standard M-type spring-loaded sheaves to provide a variable, low-speed drive in ca-



pacities from ¾ to 10 hp. Speed variation is controlled by a handwheel as illustrated, but remote control can be provided. Speed indicator and comparator scale facilitate setting the drive at any desired speed, and the screw-type control is self-locking. Motor bases are machined cast iron and can be used in angular positions to maintain proper belt alignment.—**Speed Selector Inc.**, P. O. Box 312, Chagrin Falls, Ohio.

For More Details Circle No. 478—Page 39

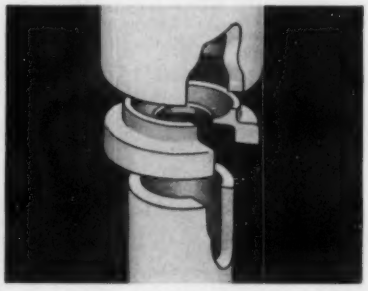
FIBERGLASS CLOTH

Fiberglass cloth, No. 391, is offered for laminating with plastic, especially in making deep, sharp contour surfaces. Material utilizes a new weave and is 0.0283 in. thick. It is claimed to provide faster laminating, require fewer layers at lower cost, and result in less interlaminar residual stresses in sharp contour laminates.—**Rezolin Inc.**, 1651 18th St., Santa Monica, Calif.

For More Details Circle No. 479—Page 39

CERAMIC CHOKE BUSHING

Ceramic choke bushing is designed to choke down sprue diameters and reduce outlet diameters of



ells and tees when used with company's refractory gating components. It utilizes a tapered entry side to eliminate metal turbulence and aspiration of air. Male and female offsets assure positive fit with other gating components. Unit is said not to spall nor erode at temperatures up to 3250° F. It is available for gating systems up to 3 in. ID.—**Universal Clay Products Co.**, Sandusky, Ohio.

For More Details Circle No. 480—Page 39

MOISTURE EXTRACTOR

Device extracts moisture from compressed air through centrifugal action created by a turbine at its inlet. Spinning turbine causes moisture to be driven out and down over a finned baffle while dry air is directed through a 40-micron filter. Finger-touch valve in the bottom of

bowl drains accumulated moisture. Unit weighs 15 oz and measures 4½ in. high by 2½ in. in diam.—**Carlson Products Inc.**, 5309 N. 24th St., Omaha, Neb.

For More Details Circle No. 481—Page 39

NEW KAISER LO-SIL* REFRACTORIES VIRTUALLY STOP ALUMINUM PENETRATION

These are unretouched photographs of cross sections of brick after a molten aluminum immersion test at Kaiser Aluminum's Department of Metallurgical Research, Trentwood, Washington. Dark areas show aluminum penetration.

BRAND A
90% ALUMINA BRICK
7 DAYS
in 7075 alloy at 1400° F.

BRAND B
90% ALUMINA BRICK
15 DAYS
in 7075 alloy at 1400° F.

BRAND C SPECIAL
HIGH ALUMINA BRICK
30 DAYS
in 7075 alloy at 1400° F.

NEW LO-SIL SUPER
30 DAYS
in 7075 alloy at 1400° F.

Kaiser Refractories' new Lo-Sil Regular and Lo-Sil Super refractory brick — designed especially for aluminum melting furnaces — achieve a major victory in saving metal, increasing purity, and extending refractory life.

Repeated tests prove Lo-Sil Super resists aluminum attack 30 times better than other low-silica, high alumina brick . . . and virtually eliminates loss of metal by absorption!

Controlled comparisons show Lo-Sil Super reduces silicon pickup to about one-twentieth that of standard 90% alumina brick. Refractory inclusions are nil. Dross removal is easy. Through increased resistance to thermal shock, impact and abrasion, Lo-Sil Super brick extends lining life and greatly reduces down-time.

Ask your Kaiser Refractories Sales Engineer about new Kaiser Lo-Sil Regular and Lo-Sil Super Brick—plus Lo-Sil Mortar.

Mail coupon at right for free copy of "Kaiser Lo-Sil Refractories," or contact Kaiser Refractories & Chemicals Division, Kaiser Aluminum & Chemical Sales, Inc. (Canadian Subsidiary: Refractories Engineering & Supplies, Ltd.)

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By W. P. WINTER
Assistant Professor
Pennsylvania State University
and
Sand Consultant, Royer Foundry & Machine Co.

Molding Sand Additives

This closing article in our series on molding sand is a general treatment of additives such as wood flour, sea coal, and silica flour. Additives are classified and their effects explained

● CURRENT LITERATURE either avoids mention of molding sand additives as a separate topic or else tends to include, in proper perspective, all materials—including clay, special binders, and water—as additives.

A great deal has been written about specific additive materials, but a broad general treatment is rare. One cannot find serious fault with the above treatment, but our objective is to generalize. A comparative discussion of as many additive materials as possible, along with a broad classification, is needed. This discussion can serve as a guide or place to begin if the need for an additive is felt, but specific materials are yet to be selected.

Molding sand consists of sand substance, binder, and additives. Any material added to the molding sand for reasons other than bond or direct improvement of bond is considered as an additive. There is some overlapping since several materials serve combination purposes depending upon conditions.

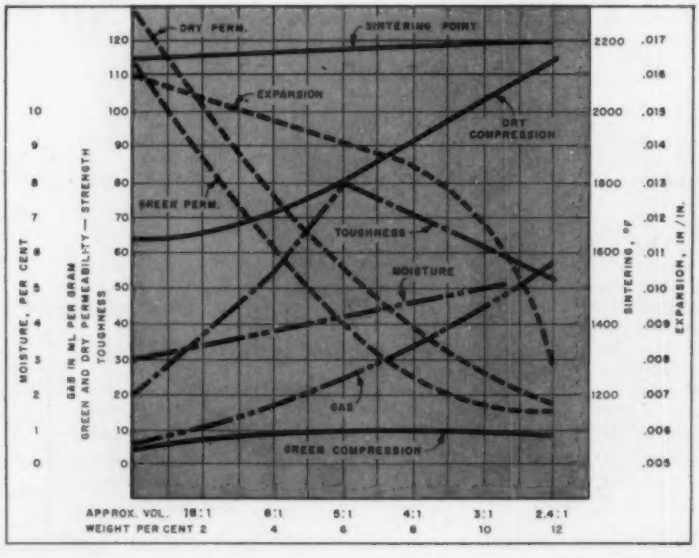
Although it appears to be a major new field, bordering on a science of molding sand, the use of additives is nearly as old as the art of molding. In fact, Vannoccio Biringuccio, the father of the foundry industry, and Leonardo da Vinci, his contemporary, were credited with the use of additives in molding sand. The writings of these and other early foundrymen mentioned animal manure and other common materials as additives. Others were cut straw, wool cardings, and even beer.

Foundrymen of any period could produce good castings and would swear by the particular additives they selected, but often they did not know why. In the modern foundry the materials have changed somewhat but basic reasons for using additives have not changed. Wood flour, sea coal, and silica flour are a few of the many additives which may be more controllable, although some foundrymen still are not sure why they are used.

Reasons for Additives—The word implies addition to the molding sand, and indeed this is the most common practice. The science of additives, if it is a science, also must include dry and liquid facings. These materials are dusted or sprayed on the sand mold surface and may effectively control some of the properties that need attention.

Green, dry, and hot strength may not be the most important properties to be altered by a specific additive but often are increased or seriously decreased. The strength of the

Fig. 1—Graph shows effect of sea coal content on some common sand properties.[2] Smoother, cleaner casting surfaces result from its addition



molding sand is a matter of binders and their control. Thermal stability, permeability, refractoriness, flowability, toughness, deformation, and other properties generally are the target of additive use. By altering and controlling these properties, the foundryman is looking for reduction of surface defects, easier cleaning, or better collapse of cores and molds.

Present evidence indicates that any molding sand addition which reduces expansion and contraction of a sand mass usually will reduce formation of scabs, rattails, buckles, and similar surface defects. This seems to be true since such defects are more readily traced to high volume change than to any other condition.

Most of the common additives improve one or perhaps several properties while, to a lesser degree, impairing another. It would be ideal if additives could be depended upon to affect one thing at a time. This multiple effect is bad, but the quantity used also is important. It can be shown that an additive which will be beneficial if used in a certain amount often will have a serious opposite effect if used too freely. The best control when detailed information is lacking is moderation.

Other problems concern the practice of producers to combine several base materials into a proprietary additive.

Additives of this type, of which there are many, are valuable, and their use is to be encouraged if producer's specifications are known and followed strictly. For example, additives of this type may contain pitch in amounts high enough to cause trouble under conditions adverse to the use of pitch.

Types of Additives—In his Hoyt Memorial Lecture in 1954, Harry W. Dietert presented extensive sand processing information. He divided additives into five groups based primarily on application. These five classes are cushioning, facing, fines, cereal, and chemical. This terminology will be altered slightly here, but the classes will be similar. Specific materials to be covered are listed according to classification as follows:

Carbonaceous Materials (facing additives)—Sea coal, pitch, fuel oil, graphite (plumbago), gilsonite, Westonite.

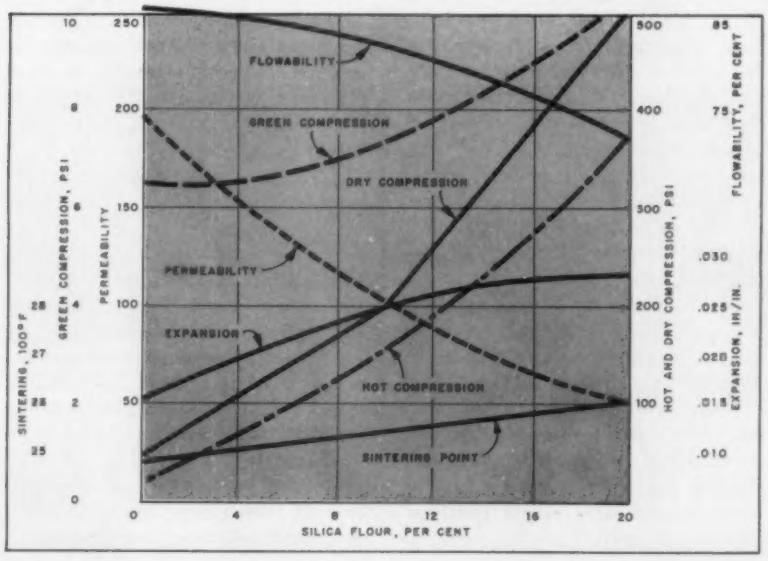
Cellulose Materials (cushioning additives) — Wood flour, cereal hulls, perlite, Masonoid R and Masonex.

Fines (fines additives)—Silica substance flours, iron oxide, flyash.

Cereals (cereal additives)—Cereal flour, dextrin, sugars.

Chemical Materials (chemical additives)—Boric acid, ammonium compounds, sulfur, sodium salts, diethylene glycol.

Fig. 2—Silica flour affects sand properties as shown on this plot.[3] It is added to sand to reduce metal penetration and increase hot strength



CARBONACEOUS MATERIALS

Sea Coal is the name for any finely pulverized bituminous coal. A low-ash, low-sulfur coal makes the best sea coal for use as an additive to the sand or as a shake-on facing. Sea coal has been used in the metal casting industry for more than 200 years. As a sand additive, it may amount to as much as 8 per cent by weight. Molten metal burns the coal, and the volatile fraction produces a reducing atmosphere which puts a carbon deposit on the sand surfaces.

Most foundrymen credit sea coal with the ability to give smoother, cleaner casting surfaces because of a reduction of burned-on sand. It also can be shown that sea coal retards expansion, reduces contraction, and slightly improves green strength and workability. Fig. 1 is a composite graph showing many of the properties influenced by sea coal. Some properties may be advantageous, but sea coal also tends to reduce permeability sharply, reduce hot strength and flowability, and increase the amount of water needed for temper.

Graphite, also known as plumbago or black lead, is a common carbonaceous facing material. It is a soft native form of carbon with high refractory qualities. It owes its value almost exclusively to its ability to improve the surface of ferrous castings.

Westonite is a soluble-base hydrocarbon. When dissolved in organic solvents and used as an additive, it aids flowability and improves shakeout and cleaning.

Pitch may be produced as a by-product of coke manufacture or by the destructive distillation of wood. It is ground and mixed with sand to increase dry and hot strength as well as to improve casting finish. It is nonhygroscopic, but produces more gas than many other additives. Also of importance is its ability to decrease expansion and contraction and improve deformation. Excessive use, much over 2 per cent, lowers green permeability; larger amounts also increase the gas problem.

Gilsonite, a natural asphaltic material, is ground and used in smaller amounts to produce conditions similar to those produced by pitch. Only 0.4 to 0.8 per cent is needed to produce conditions requiring up

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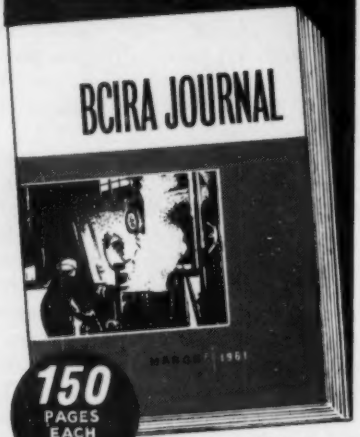

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For More Information Circle 599, Page 39

to 2 per cent pitch. It also can be used as a sea coal substitute.

Fuel oil, the common petroleum product, in amounts up to 3 per cent is credited with lowering moisture requirements and reducing the air-drying of the sand. These results help to control moisture. Less sea coal is needed when fuel oil is used, but fuel oil creates a more serious gas condition than sea coal.

CELLULOSE MATERIALS

Wood flour is finely pulverized soft wood fiber from which the natural resins have been removed. Like all additives of this class it is a cushion, used to minimize expansion defects. Common amounts range from 0.5 to 2 per cent and produce a slight increase in green strength, flowability, and collapsibility. This last factor is an aid to cleaning, making shakeout easier. Although these effects are improvements, wood flour also seriously decreases dry and hot strength and permeability and increases the need for temper water.

Perlite, another of the cushion additives, is a highly siliceous material, essentially aluminum silicate. In the form used in the foundry it has been expanded to a porous mass by heating. It may be added to sand in amounts ranging from 0.5 to 1.5 per cent to aid thermal stability. Another valuable use is as a riser insulator.

Cereal hulls also are used as cushioning material. Such additives are useful in reduction of mold wall fracture even though they reduce dry and hot strength. Most of the cereal hull materials have been treated to retard combustion. In addition, the foundryman must control fines to provide constant rate of combustion in routine practice. Because of differences in density, these materials are best measured by volume rather than weight. Density values may be obtained, but experimentation will help provide the best answer regarding quantity.

Masonoid R, the dry form, and *Masonex,* the water solution form, are two cellulose materials that behave much like corn cereals. They improve flowability and surface finish without decreasing or increasing permeability or strength. A reduction in bentonite requirements has been claimed when these additives are properly used.

FINES

Silica flour and other finely ground mineral substances such as olivine, zircon, and alumina often are used to reduce metal penetration while increasing hot strength of the molding sand. These materials are ground to a particle size of less than 54 microns or approximately 270 mesh and smaller. In addition to increasing hot strength, they increase toughness and deformation, but decrease flowability and permeability. They also may increase moisture required to temper. Fig. 2 illustrates some of these properties. These mineral flours are used in varying amounts, as high as 35 per cent in some cases.

Iron oxide (ferric oxide or Fe_2O_3) is another common material in this class. It has effects similar to those credited to silica flour, but less of it is needed. Common amounts used range between 0.25 and 1 per cent by weight.

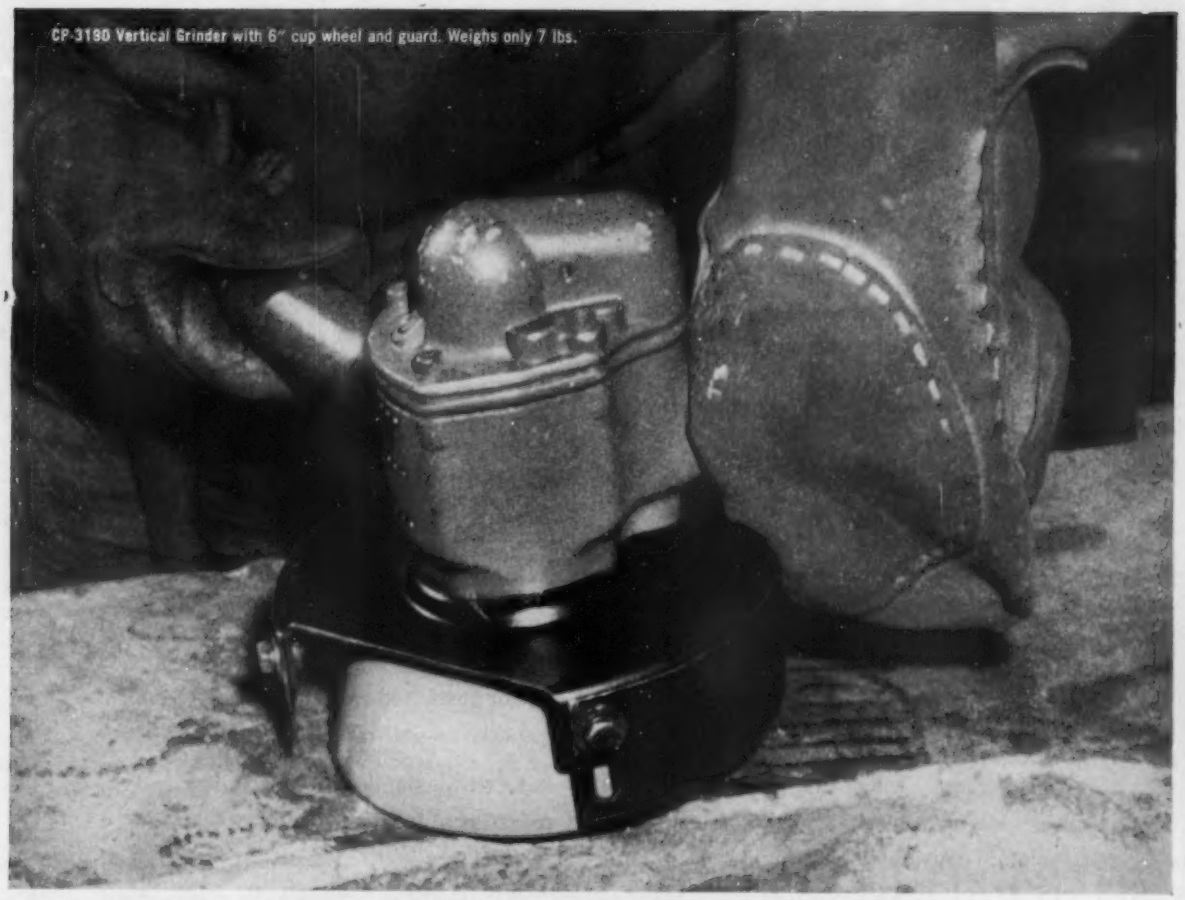
Fly ash, the fine ash residue from coal burning power installations, is a cheap and highly satisfactory material for control of fines. It has many of the effects credited to the mineral flours. One major disadvantage is the dusty nature of fly ash. Among the newer uses of fly ash is its application in sodium silicate bonded sands to improve blowability.

CEREAL

Cereal flours and starch substances often used as binders also are useful as additives. Cereals possess many useful and interesting properties and may be valuable as an additive to one foundryman while proving to be a thorn in the side for another. Cereals generally improve all strengths along with toughness and collapsibility, but decrease flowability and green permeability.

An asset is their tendency to reduce surface drying in bentonite-bonded sands even though the moisture requirements are increased. They also act as buffer materials, helping to control expansion and minimizing expansion defects. They are especially useful where carbonaceous materials would be a distinct disadvantage. Usual amounts range from 0.25 to 2 per cent for additive applications.

Dextrin, a soluble carbohydrate derived from starch, has some value as a sand additive. Its chief value



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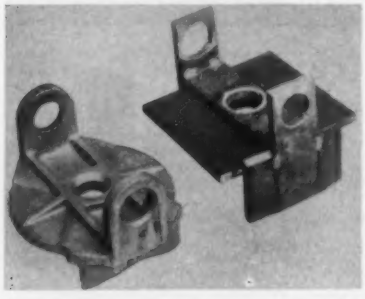
lies in its ability to increase dry strength. Dextrin has several drawbacks, however, since it produces a strong, irritating gas and it lacks the ability to improve green strength.

Molasses, the crude blackstrap variety, has a long history of use in the foundry, but in modern times has lost favor. At one time, few self-respecting foundries would operate without using molasses water for temper or for spray applications. Improved mold surface conditions were claimed, and strength was improved. The newer additive materials tend to provide the properties needed in modern synthetic sands without this material.

CHEMICAL ADDITIVES

The use of chemicals as sand additives is a more recent development and should be treated as a separate study. More research and study of possible materials is needed. One exception is the molding sands used for magnesium castings, in which boric acid, ammonium compounds, and sulfur have been used for some time to prevent metal-mold reactions and to produce a smooth surface.

Sodium salts have been experimented with to control the acidity of molding sands. Much already has been done on the evaluation of the pH of sands and the use of chemical additives to control it. In still another example of a chemical additive, some use of diethylene glycol has been claimed. Its purpose is to reduce surface drying in sands bonded with bentonite.



COST SAVING—A 45 per cent cost reduction was effected when this swivel bolster for a tank trailer was made as a malleable iron casting (left) instead of as a steel weldment. Better appearance and a 2½-lb weight reduction were other benefits. Northern Malleable Iron Co., St. Paul, produced the part.

There is room for much more research and experimentation in additive use of various chemicals.

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U of Cincinnati Adds Graduate Degrees in Materials Science

The department of chemical and metallurgical engineering at the University of Cincinnati now is offering course work toward graduate degrees in materials science. Both the master of science and doctoral degrees will be offered in the new area, which will include studies of ceramics, plastics, and related materials as well as metals and all their applications. Students can enter the program from undergraduate backgrounds in either engineering or chemistry and physics. Chairman of the program will be Dr. Michael Hoch, professor of metallurgical engineering.

Cincinnati is among the first universities in the country to offer such a program. Other institutions introducing it include Northwestern, Stanford, and Cornell Universities.

Shows Industry Use of Films

A new informational film depicting many of the ways motion pictures can serve industry is available on loan from Eastman Kodak Co. Entitled "Movies at Work," the film is a 16-mm color and sound production that runs for 14 minutes.

It shows uses for motion picture equipment and film which include safety instruction, time-motion analysis, slow-motion studies, employee training, time-lapse films for traffic studies, supervisory and sales-training films, and filmed reports. The movie may be obtained without charge for individual showings from the Audio-Visual Service, Eastman Kodak Co., Rochester 4, N. Y.

Circle 602 on Page 39→

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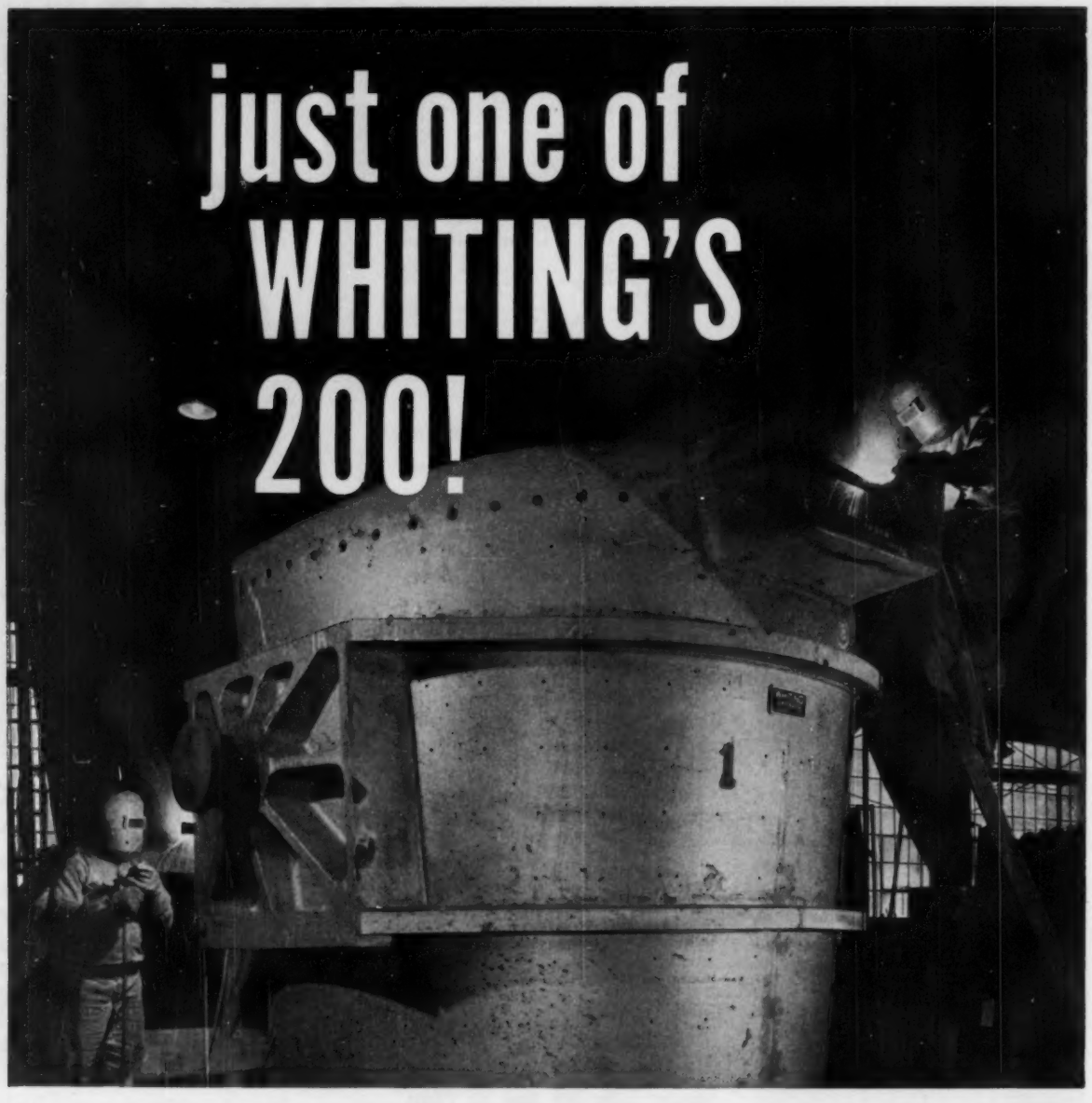

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INDUSTRY BRIEFS...

Harvill Corp., Los Angeles, has begun construction of a new $1.3 million, 101,000-sq-ft manufacturing facility which will increase production capacity by more than a third. The modern plant for manufacture of diecast metal and molded plastic products will be located in Rancho San Pedro Industrial Area near Compton, Calif., and is scheduled for occupancy in early July. Harvill will transfer all operations from its present location at 6251 W. Century Blvd. to the new facility.

American Combustion Equipment Co., 614 12th St. N. W., Canton, Ohio, has been formed with D. E. Jenkins Jr. as president. The company will offer consultation in furnace design and engineering and will carry out research and development projects in the combustion field. Manufacturing facilities in Dover, Ohio, will handle production of a new high-velocity, release-type burner for gas and oil.

Woodruff & Edwards Inc., Elgin, Ill., will continue operations as a foundry and machine shop under the same name. These two divisions of the original corporation were purchased by a group of employees who have formed a new company with A. Gordon Heitman as president.

Cast-Master, a department of H-P-M Div., Koehring Co., will move its entire manufacturing and administrative operations from Bedford, Ohio, to H-P-M facilities in Mt. Gilead, Ohio. The move is scheduled for completion by July 1, 1961. Cast-Master manufactures diecasting machines.

Danko Arlington Inc., 4800 E. Wabash Ave., Baltimore 15, Md., has been formed through the merger of Danko Pattern & Mfg. Co. and Arlington Bronze & Aluminum Corp. The new company, specializing in patternmaking, permanent molds, and nonferrous castings, has 125 employees and more than 31,000 sq ft of floor space. Joseph O. Danko Sr. is chairman, and Joseph O. Danko Jr. is president.

Allis-Chalmers Mfg. Co., Milwaukee, plans to convert its No. 2 gray iron foundry building into a new tractor assembly line. To make room for the new operation, Allis-Chalmers has arranged for the liquidation of the mechanized foundry equipment now installed in the building.

Oak Hill Foundry & Machine Co., Oak Hill, Ohio, plans to resume full operations in April after a $100,000 fire which damaged the cleaning room, coreroom, sand mixing department, pattern storage, and machine shop. Since a new building was being constructed at the time, the company continued with limited operations immediately.

Select Enterprises Inc., Wilmington, Ohio, has been formed to market a scrap breaker which breaks cast iron and rail without pulverizing. Officers are Alexander Raizk, president; Lincoln Raizk, vice president; and P. P. Pusateri, secretary.

Central Foundry Co., Newark, N. J., producer of cast iron soil pipe, plans to acquire an electronic component manufacturer, according to an announcement by Sidney Gondelman, president and chairman.

General Electric Co. is closing its foundry in Everett, Mass., and will complete the shutdown by the end of the year. Most of its operations will be transferred to Schenectady, N. Y., site of the only GE foundry equipped to make a

METALLURGICAL GRANT: Establishment of a permanent chair of metallurgical engineering at the University of Cincinnati in the name of Peter E. Rentschler, president, Hamilton Foundry Inc., was announced recently. It was made possible through a gift of $103,105 by the Hamilton Foundry Inc. Foundation and the Decatur Casting Co. Foundation. Shown at a campus luncheon honoring Mr. Rentschler (right) are, left to right, Dr. Walter C. Langsam, UC president, and Dr. Roy O. McDuffie, first Rentschler professor of metallurgical engineering

HOW TO DO IT

By ROBERT H. HERRMANN
Associate Editor

Numbered Metal Hooks Are Key To Pattern Storage System

ACTIVE STORAGE for about 600 patterns is provided by a rack and hanger arrangement at I. F. Mfg. Co., New Philadelphia, Ohio. Key items in the storage system are the pattern plate hooks fabricated from $\frac{1}{8}$ x $1\frac{1}{2}$-in. steel bar stock. Patterns on the hooks are identified by sizable numbers on pressure sensitive adhesive paper stuck to the hooks.

Patterns are located by reference to a 3 x 5-in. card file. Two sets of cards are kept: One is filed numerically by customer pattern number, and the other is filed alphabetically by customer name. Cards in each file contain the storage hook number.

Although the hooks are arranged in numerical order on the racks, a quick reference wall chart shows the exact position of each hook. This facilitates quick location of a pattern even by someone unfamiliar with the storage system.

Have any ideas of your own? FOUNDRY will pay a minimum of $15 for each "How To Do It" item submitted and published

full range of steel castings. The company states that the Everett foundry no longer could be operated profitably. It operated at a substantial loss during the last three years.

Philadelphia Industrial Development Corp. will build a $2\frac{1}{4}$ million research building for the Franklin Institue on a site adjacent to the institute's main building. When completed late in 1962, the six-story building will enable the institute to expand the personnel and activities of its research laboratories, which now employ 350 scientists and technicians.

Arkansas Foundry Co., Little Rock, Ark., is terminating operation of its gray iron foundry to make room for the expansion of other divisions.

Lord Chemical & Equipment Div. of Wheelabrator Corp., Mishawaka, Ind., is the new name of Lord Chemical Corp., York, Pa. The division will continue manufacture of precision finishing equipment, media, and compounds at York and at Red Lion, Pa.

Four Wheelabrator Fellowships Awarded for Graduate Study

Four students have been selected for 1961 Wheelabrator Fellowships by the Board of Awards of the Foundry Educational Foundation.

Robert G. Chambers, Jonesboro, Ga., who graduated from Georgia State College in the top 5 per cent of his class, will do his graduate work at the University of Alabama. His father is foreman at Cox Foundry & Machine Co., Atlanta.

David B. Routledge, Lexington, Ky., held an FEF scholarship in his undergraduate days at the University of Kentucky and he will do graduate work in business administration at the same university. His father is associated with Hickman, Williams & Co.

William F. Stuhrke, Cleveland, will graduate from Case Institute of Technology in June and plans to continue his study there at the graduate level. He has been an FEF scholarship student.

R. G. CHAMBERS

D. B. ROUTLEDGE

Thomas H. Steffen, Chicago, a mechanical engineering senior at the University of Illinois, also will graduate in June and intends to study both engineering and marketing in his graduate work at that school.

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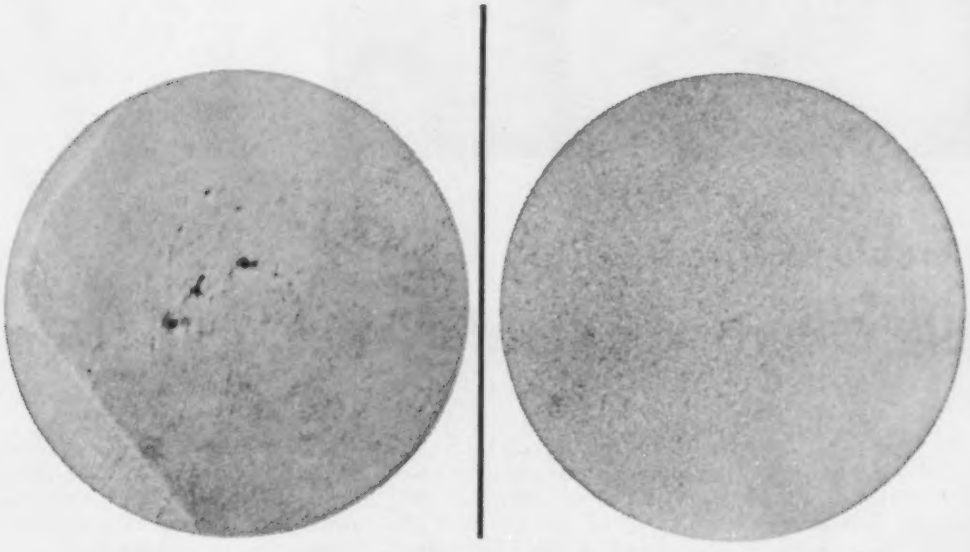

Sand casting at left shows typical surface shrinkage. Sand casting at right, produced under same casting conditions, was made from Federated PT Grade ingot.

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Participants included, from left to right, Charles H. Ker, Dalton Foundries Inc., speaker; Charles P. Speitel, Pennsylvania Malleable Iron Co., MFS president; Dorian Shainin, Rath & Strong, a speaker; and Bernard Brissie, Laconia Malleable Iron Co., a session chairman

Technical Problems Discussed at

Malleable Operating Conference

● RESEARCH and production tools and the role of supervisors in management were the general subjects discussed at the sixth annual Technical and Operating Conference of the Malleable Founders' Society. Held at the Pick-Carter Hotel, Cleveland, March 1-2, it drew an attendance of 85.

Charles P. Speitel, MFS president, opened the conference by exhorting foundrymen to make more effective use of existing knowledge and proved production methods to make quality castings. Foundrymen must keep up to date and use new methods where they apply. The prime goal is to satisfy the customer. Fertile areas for future industry development are in marketing, financial planning, and customer service.

The opening technical talk, **Tools for Effective Gating and Risering,** was by Prof. John F. Wallace, Case Institute of Technology, Cleveland. He discussed the design of gating and risering systems to produce castings of the quality desired. Full understanding of the principles of correct gating and risering and their application in production is necessary if desired casting quality levels are to be reached economically.

The Supervisor's Position on the Management Team—by Charles H. Ker, Dalton Foundries Inc., Warsaw, Ind. A difference exists between what a supervisor thinks the foreman's job is and what the foreman thinks his job is. A foreman's job should be defined precisely, and all concerned must understand the definition.

Mr. Ker assumed the foreman's point of view in outlining the details of his job in the areas of production, planning, materials and equipment acquisition, maintenance, personnel handling, and budget preparation.

Design of Experiments—by Dorian Shainin, Rath & Strong, industrial consultants, Boston. A foundry can reduce costs and increase profits if it reduces scrap and makes castings right the first time. Two approaches to scrap reduction were discussed.

1. The scientific method of changing one variable at a time, while holding all others constant can be used. The cause can not always be segregated this way, however, because it may result from a combination of factors.

2. The problem of multiple factors can be overcome by using the variation research method of finding cause of scrap. This method resembles the limited question television programs. It also makes use of the Latin Square statistical device.

Speaking on **These Four Problems** at the Wednesday luncheon, Lowell D. Ryan, MFS executive vice president, pointed to the continuing need in the industry for a merchandising concept, increased productivity, better capital planning, and improved engineered selling.

Furfuryl Resins as Binders—by Victor Rowell, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland. These binders are formed by a reaction of furfuryl alcohol with formaldehyde and urea which in use is polymerized or hardened by an acid catalyst. Two types are available. One is an air setting or self-hardening type usually employed to make large cores. An acid, such as phosphoric, is mixed with the sand, the binder is added with further mixing, and the mixture is rammed into the corebox. Working life and curing time are controlled by the amount of the acid.

The other kind of binder is the hot-box type, which uses an acid salt as the catalyst and functions by the action of heat. One such salt formed from a strong acid and weak base is ammonium chloride. Cost of core sand mix with furfuryl binder is 45 to 50 cents per 100 lb compared with 70 to 90 cents for phenolic resin for shell cores and 15 to 20 cents for oil-sand.

The binder hardens enough in 7 to 12 seconds that cores can be

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For More Information Circle 605, Page 39

ejected from the corebox; complete hardening occurs in 15 to 20 minutes. In cores with more than 3-in. section, it is possible to drain sand from the interior and use it again. Cast iron coreboxes are preferred because of their heat capacity and uniform temperature.

Synthetic Resins in the Pattern Shop—by R. J. Simon, Saginaw Malleable Iron Plant, Central Foundry Division, General Motors Corp., Saginaw Mich.—Applications of epoxy resin include patterns, checking fixtures, and inserts in coreboxes to withstand abrasive wear. The cost ranges from 30 to 60 per cent of that of metal equipment, and production time is about 60 per cent. With plaster molds on hand, the patterns can be reproduced at about 22 per cent of the original cost.

The Changing Face of Research, by J. H. Winkler, Battelle Memorial Institute, Columbus, Ohio—Two kinds of research are 1) applied or industrial research to develop new products, materials, or production methods which can be placed on the market or in operation as soon as possible and 2) basic or fundamental research to obtain information on how, when, why, and where.

Basic research is long-term work which often cannot be translated into the applied field for many years, but since it forms the foundation, more should be conducted.

What the Purdue Research Means to the Malleable Foundryman—by Dr. George F. Sommer, Link-Belt Co., Indianapolis. The society's sponsored work at Purdue covers both fundamental and applied research, with some of the former type directly related to practical applications. Current work includes stress-rupture testing and thermodynamic studies.

Broadening use of pearlitic malleable iron in recent years was preceded by an extended period of development, and the best investment that foundries can make to assure their being in business years hence is to pursue a program of basic and applied research today.

New Horizons in Welding and Brazing—by Howard Cary, Hobart Bros. Co. Because of brittleness developed in the heated zone, welding of malleable iron generally is avoided when the parts are highly stressed or subject to impact. Nevertheless, considerable welding is being done successfully, and the subject warrants more investigation. In welding malleable iron it is desirable to heat the metal for the shortest period that will provide fusion. Sometimes it is possible to design the part to allow for lower strength in the welded section.

Simple tests performed on malleable parts, employing various types of welding processes and rods, indicated that a nickel rod produced the highest strength, but that a mild steel type was the most economical.

Structural Adhesives — a New Method of Joining—by E. F. Hess, Minnesota Mining & Mfg. Co., Minneapolis. Advantages of modern adhesives for joining metals include even distribution of stress and some flexibility in the bonded area; continuous contact between mating surfaces; no problem in joining dissimilar metals; maintenance of integrity of structural members through elimination of holes for rivets or heat from welding; and ability to provide smooth contours.

Type of adhesive used—elastomeric phenolics, thermosetting materials, or chemically curing types—depends on the application. Study also is required in selecting the type of joint to employ.

At the Thursday luncheon, Norman Zlatin, Metcut Research Associates, discussed the machinability of various types of ferrous cast metals and pointed out that both ferritic and pearlitic malleable possess good machining characteristics.

The final afternoon session was devoted to a panel discussion of **The Supervisor's Position on the Management Team** at which Donald B. Fulton, Northern Malleable Iron Co., St. Paul, was moderator. Three papers were presented, as follow:

Production Planning—by N. J. Jacobs, Albion Malleable Iron Co., Albion, Mich. The foreman has a long list of responsibilities, but essentially he must plan, inform, organize, and direct. He must see that production is not interrupted. The production schedules should come from the production planning department.

Production planning is the technique of foreseeing and planning all steps in production beforehand. At Albion, it is planned at a central point. The foreman implements that planning.

Budget Control—by R. J. Crites, Chicago Railway Equipment Co., Chicago. Planning and co-ordination make progress possible. Success is proportional to the development and execution of plans. These points apply to economic activity as well as to any other, and economic plans are budgets. A company must be able to plan and to

Among conference speakers were, left to right, George F. Sommer, Link-Belt Co.; Robert J. Simon, Central Foundry Div., GMC; J. Homer Winkler, Battelle Memorial Institute; and Victor Rowell, Federal Foundry Supply Div., Archer-Daniels-Midland Co. Mr. Sommer spoke on research, the others on new foundry materials, machines, and processes

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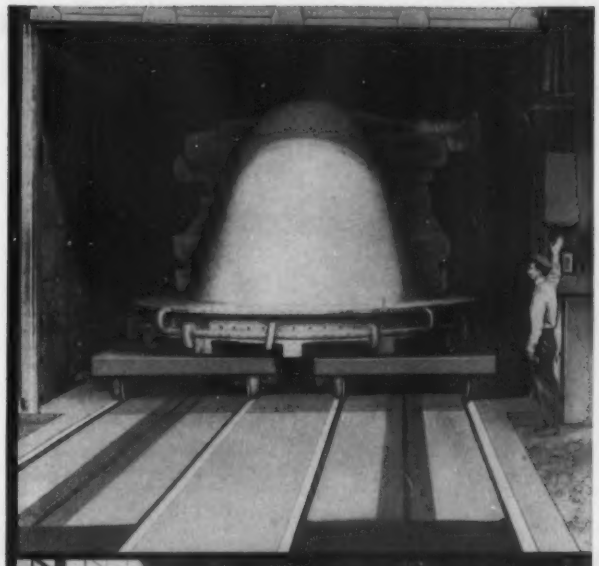

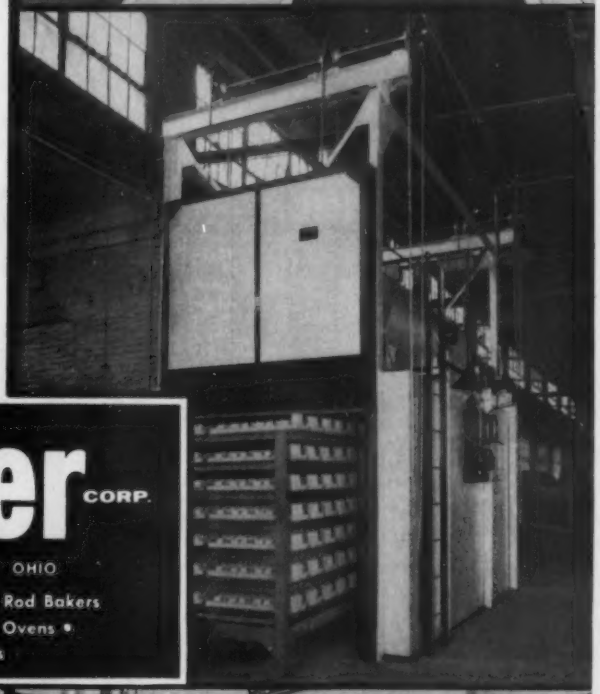

TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Car type mold drying oven installed at Centre Foundry, Wheeling, West Virginia.

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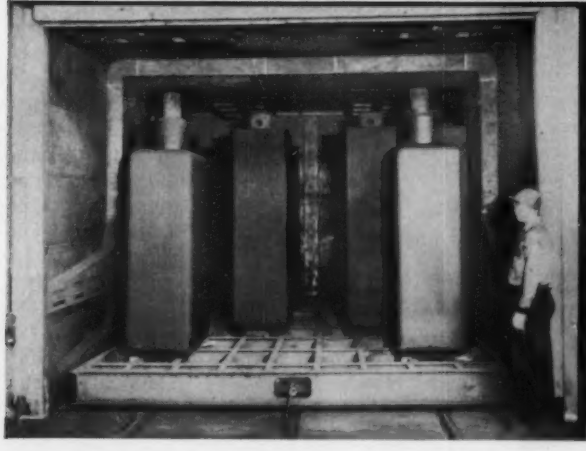

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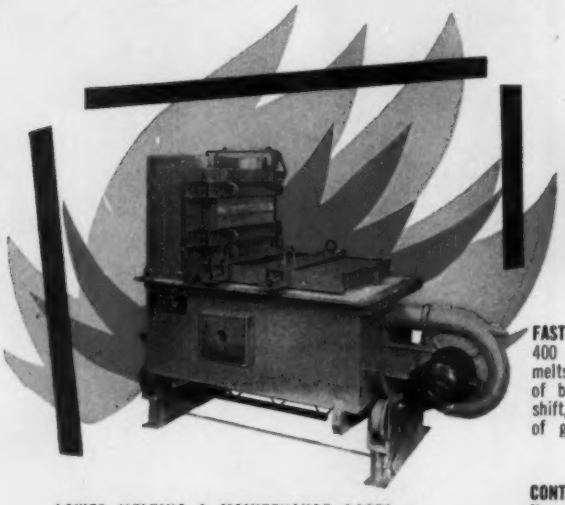

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maintain flexibility, and the line supervisor can help in both respects. He is the first line of management.

Communications and Quality Control—by L. K. Vollenweider, Deere & Co., Moline, Ill. Quality must be built into products, and the foreman's part in quality achievement is vital. Effective quality control has to be accurate, adequate, and promptly communicated. When a job gets out of control, the foreman concerned should be notified immediately of the problem and its nature. The core of the quality control problem is at the machine where production takes place. Consequently, the first line is front-line supervision.

Booklet on Heat Treatment of Ferrous Materials Offered

National Bureau of Standards has made available Monograph 18 entitled "Heat Treatment and Properties of Iron and Steel" by Thomas G. Digges and Samuel J. Rosenberg to answer inquiries about heat treatment of iron and steel.

Effects of various treatments on the structures and mechanical properties of these materials are described. A listing of all current structural, tool, and stainless steels, and recommended heat treatments is included.

Monograph includes 40 pages and costs 35 cents. It can be ordered from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Three Training Films Cover Principles of Supervision

Three new films for supervisory training are available from Modern Management Films, a division of the Bureau of National Affairs Inc. Suitable for office or plant supervision, the films are short, 16mm sound and color motion pictures, designed to teach basic principles of supervision and stimulate discussion of supervisory problems.

The films may be purchased either singly or in series, or they may be rented. For further information write to Modern Management Films Div., Bureau of National Affairs Inc., 1231 24th St. N.W., Washington 7, D. C.

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For More Information Circle 609, Page 39

..FOUNDRY DEVELOPMENTS

By EDWIN BREMER
Metallurgical Editor

Nickel Alloy Data

GUIDE to compositions and physical properties of over 30 nickel-base alloys is given in a report released recently through the Office of Technical Services, U. S. Department of Commerce, Washington 25. Report is in two sections. The first gives the chemical compositions of the various alloys, and the second provides information on the physical properties. Report is designated PB 151,086 "Physical Properties of Some Nickel-base Alloys" by M. E. Lanston and C. H. Lund, and may be obtained from the Department of Commerce for $2.75.

Cerium Additions

REPORT on "Some Investigations on Cerium-treated Cast Iron" by M. Homma, A. Minato, H. Meguro, and Y. Abe, appears in the *Science Reports of the Research Institutes,* Tohoku University, Sendai, Japan, Vol. 12, No. 6. Results indicate that with increase of cerium content the structure of the cast iron changed from gray to white, passing through an inverse chill condition.

It was verified that formation of white cast iron by cerium is caused by supercooling of the melt accompanied by strong deoxidation. Mechanical properties of cerium-treated, quick-anneal malleable with silicon content are higher than those of commercial blackheart malleable. By controlling cerium, carbon and silicon, castings of heavy sections can be produced.

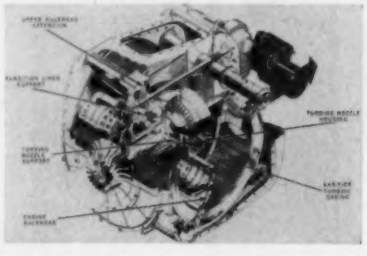
Rebonding CO_2 Sand

INVESTIGATION in one British foundry resulted in a method of rebonding used CO_2 process sand for casting production. The procedure, described in "Economy with the CO_2 Process" by D. J. Cousins in the Jan. 19 issue of *Foundry Trade Journal,* is to place the lumpy knockout CO_2 sand in a roller-type mill with the addition of sufficient moist sand to provide a moisture content of 0.75 per cent, and mill for 5 minutes to break down the lumps. Then 4 per cent silicate binder is added and milling continued for 3 minutes. Many castings weighing from a few pounds to a few hundredweight were produced successfully. Knockout was no problem, and the castings stripped clean.

In Hot Spot

HIGH-ALLOY castings have been used liberally by engineers of the Allison Div., General Motors Corp., Indianapolis, Ind., in the design of the GMT-305 Whirlfire regenerative gas turbine engine. This was done to solve the problems of high temperature, corrosive combustion products, and high stress that are inherent in vehicular gas turbine engines.

Accompanying illustration indi-



cates location of six important cast components in the "hot area" of the engine. The castings are made of SAE 60347 alloy (Alloy Casting Institute CF-8C), which contains 0.08 max C, 1.50 max Mn, 2.00 max Si, 18-21 Cr, 9-12 Ni, and 8 times C min up to 1.0 max Cb.

White Iron Study

WHITE iron eutectic usually solidifies in the form of ledeburite, consisting of a more or less continuous phase of carbide interspersed with rods or globules of austenite. At times, however, the eutectic solidifies with a platelike structure, and in that case the iron possesses higher mechanical strength.

In a study to determine the possibility of promoting the plate-like structure, as described in "Eutectic Structure in White Cast Iron" by J. Rickard and I. C. H. Hughes in the January issue of *BCRI Journal,* it was concluded that ledeburite solidifies with only moderate undercooling and recalescence, and is nucleated at points on the mold-metal interface.

The platelike eutectic occurs only when nucleation of ledeburite is avoided; it is accompanied by considerable undercooling and recalescence, and is nucleated at various points throughout the melt without any preference for the mold-metal interface. The structure is promoted by superheating the iron and by melting and solidification in recrystallized alumina refractories.

Mold Dressing Effect

TESTS conducted by B. P. Betts and V. Kondic and described in "Effects of Mould Dressings on Casting Fluidity of Some Alloys" in the January issue of *The British Foundryman* show that oxide-base materials such as talc, zircon, and silica improve mold filling, and the effect increases with decrease in the grain size of the material.

Talc appears to be most effective in improving the casting fluidity of the several alloys, which included cast iron, gun metal, aluminum, and cast steel. Graphite reduced fluidity with some alloys or gave only small improvement with others. Coarse molding sand reduces and fine sand increases fluidity.

Expansion Is Cause

Inoculation of hypoeutectic gray cast irons produces a rise in degree of eutectic nucleation. Associated with this is an increase in unsoundness, according to a report "Inoculation and Casting Expansion" by K. E. L. Nicholas in *BCIRA Journal,* January, 1961. It concludes that the characteristic unsoundness of inoculated cast irons is due to increased casting solidification expansion which is related to the degree of eutectic nucleation.

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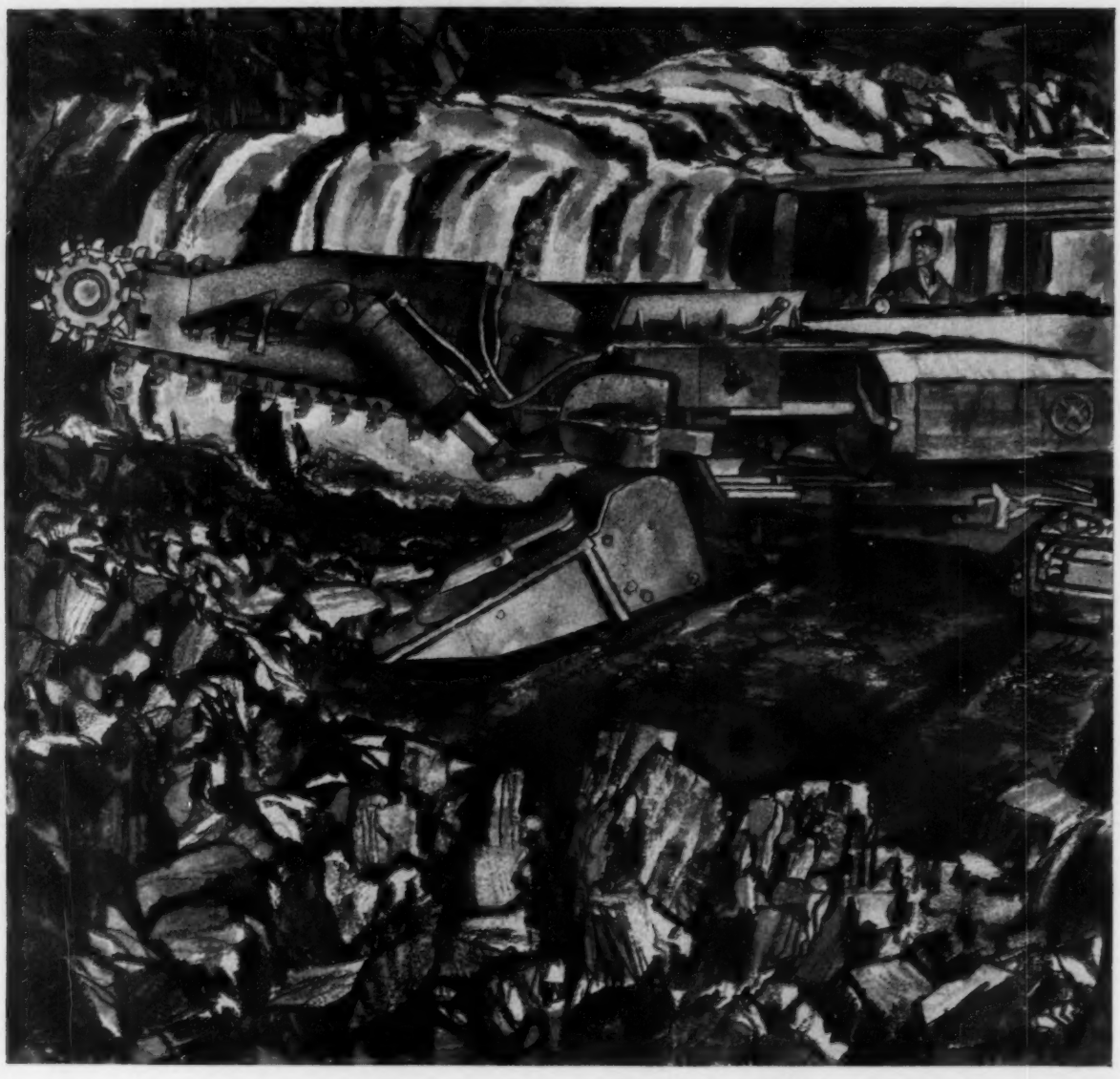
Birth of a Gray Iron Casting—No. 2



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Incentive Plan Cuts Casting Repair Costs

By ROBERT C. BATCHELOR
Managing Consultant
Albert Ramond & Associates Inc.
Chicago

● CASTINGS made under ideal conditions would have no inclusions, misruns, shrinks, cracks, or other defects. But since some defective castings are being made, management faces the problem of doing everything possible to minimize repair costs.

Unless a foundry has a sound, effective work measurement and wage incentive plan, chances are that part of every repair dollar is wasted.

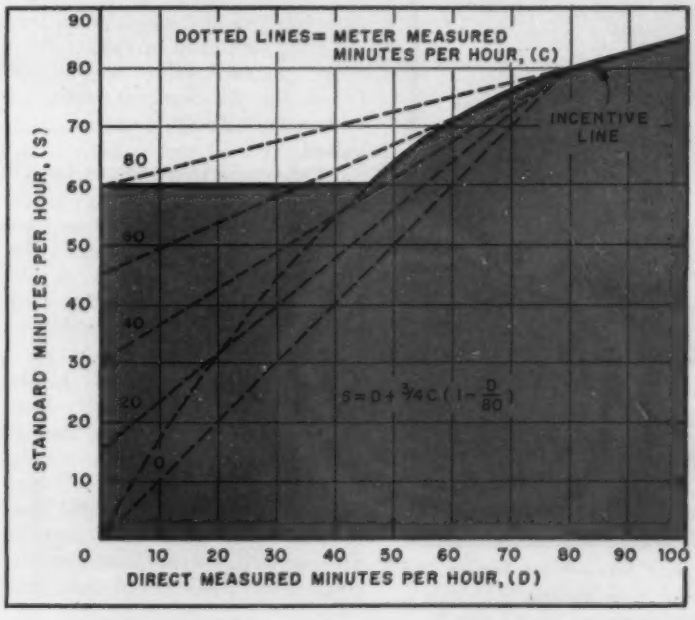
One steel casting company recently combined better repair methods with an unusual work measurement and incentive plan. The results: A 25 per cent reduction in casting repair costs, an 80 per cent jump in repair labor productivity, a 23 per cent increase in operator earnings, a stabilizing of operator performance regardless of fluctuations in volume or type of castings, and a noticeable improvement in quality.

Improved Method — The new method centered around the adoption of the arc-air technique. Equally important was an improvement in operator efficiency. The company instituted work standards as the logical means to measure productivity, and incentives were used to provide the best motivation.

Work Standards—The combination of two work measurement techniques formed the basis for establishing work standards. One was the meter method for clocking machine time. The other was direct measurement of operator effort, using time study or standard data. Both methods commonly are used to measure welding operations but because of inherent weaknesses in both, only a combination of the two provides an equitable method.

A good standards and incentive application requires: 1. Work standards must closely reflect the true work necessary in making different types of repairs. 2. Work assignments must be clear so that the operator knows what must be done to each casting. 3. Production count must be accurate so the company knows how many units each operator has repaired.

The meter method is the most common way of measuring actual welding work. Clock meters record actual arc contact time which is adjusted by suitable factors to compensate for the nonwelding portion of the job. In actual practice, this approach has two serious drawbacks. First, meters indicate only the duration of machine operating time, not what work actually was necessary—a matter of the operator's judgment. Second, there is a natural tendency as the production workload decreases for the operator to do excessive gouging, welding, and washing merely to maintain incentive earnings. Another variation of the metering method, based on the amount of welding rod consumed, is unsatisfactory for the same reasons.



Graph shows plot of productivity formula with an incentive line superimposed. Number of standard minutes produced per hour is the basis for pay

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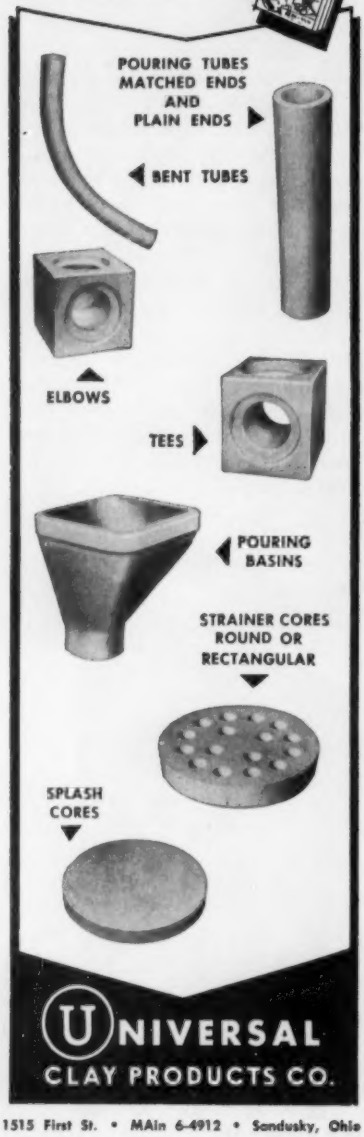

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For More Information Circle 612, Page 39

The direct measurement approach first calls for classifying all common types of defects and using time study or standard data to establish work standards for each type and size of defect. An inspector marks the defects and classifies them before repair work starts so that the total standard time for the job is predetermined.

This method also has shortcomings since visual inspection doesn't always reveal the extent of shrinkage cavities and cracks. These facts are revealed fully only during gouging. If the predetermined repair time is too short, the operator may neglect quality and be more concerned with the number of castings repaired.

Another method is to develop a relationship between work content and the number of pieces or pounds handled. This method often works fine in a mass-production type operation but not in a jobbing foundry where defective parts may vary widely from day to day.

Combined Technique — In the new combined technique for measurement, the advantages of each method offset the disadvantages of the other, resulting in a single standards system to measure overall work content and serve as a basis for incentive calculations.

First, defect classifications were established to cover shrinks, misruns, cracks, inclusions, blows, undercuts, undergrinds, and penetrations. Next, time study provided repair standards to cover the defects by type and size. Some typical ones are shown in Table I. Similarly, standard values were established for fin removal, washing, and other direct operations involved.

At the same time, factors for adjusting clock meter readings covering wash and weld operations were established to credit the operator for the nonrecording portion of the work cycle. Examples are a wash cycle factor of 2.0 and a weld factor of 3.0.

Productivity Formula — In the combined technique, both direct measurement standards and average clock measurements determine the work required to repair each type and size defect under normal conditions. The latter data also reflect any deviation from normal conditions. Both sets of data were incorporated into a single, special formula. The formula is $S = D + \frac{3}{4}C\ (1 - D/80)$ in which S equals productivity in terms of standard minutes per hour, C is the clock measured minutes per hour, and D represents the direct measured minutes per hour.

This relationship, which applies whenever values of C and D are less than 80 minutes per hour, is plotted by broken lines on the graph. Minor delays and conditions beyond the control of the operator are provided for since the standard minutes are always greater than C and D. Since these do not occur with any specific frequency, no other allowance is provided for them.

In this case, the company has guaranteed the base rate so there is no penalty for performance below 60 standard minutes per hour. In other words, if a worker's performance falls on a point within the shaded area on the graph, his standard time is given by a point directly above on the incentive line.

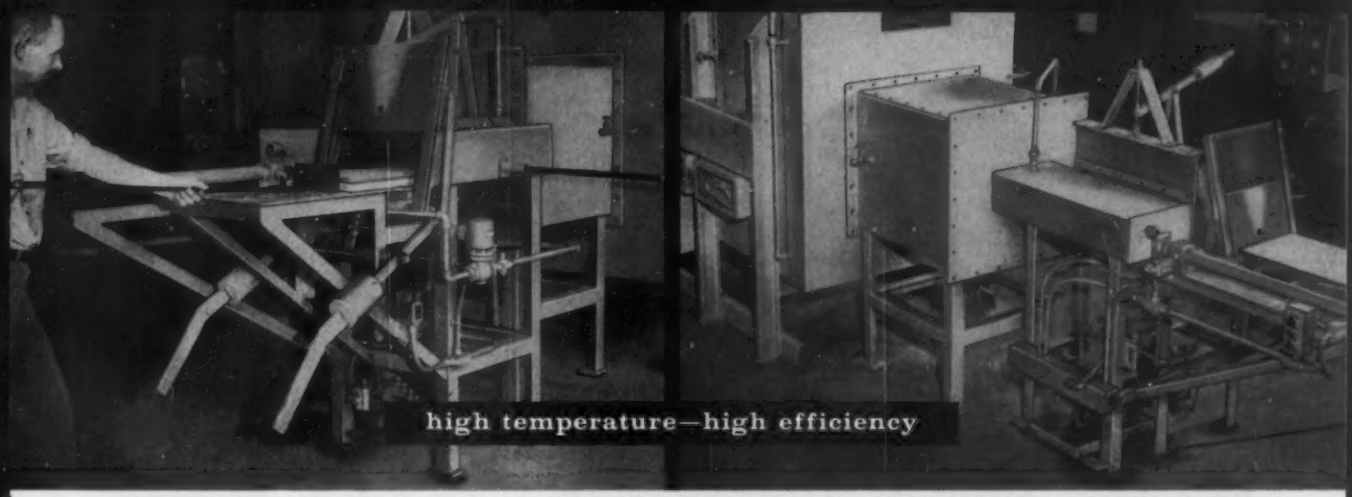
TABLE I—Typical Standards

Defect	Repair Time (minutes)
Inclusion (4 sq in.)	8.03
Misrun	2.72
Crack (3 sq in.)	7.14
Shrink	3.59

At the same time, the relationship satisfies the basic criterion of the incentive plan to reward operators for basic performances exceeding a 60-min. hour. These standards are set so an average

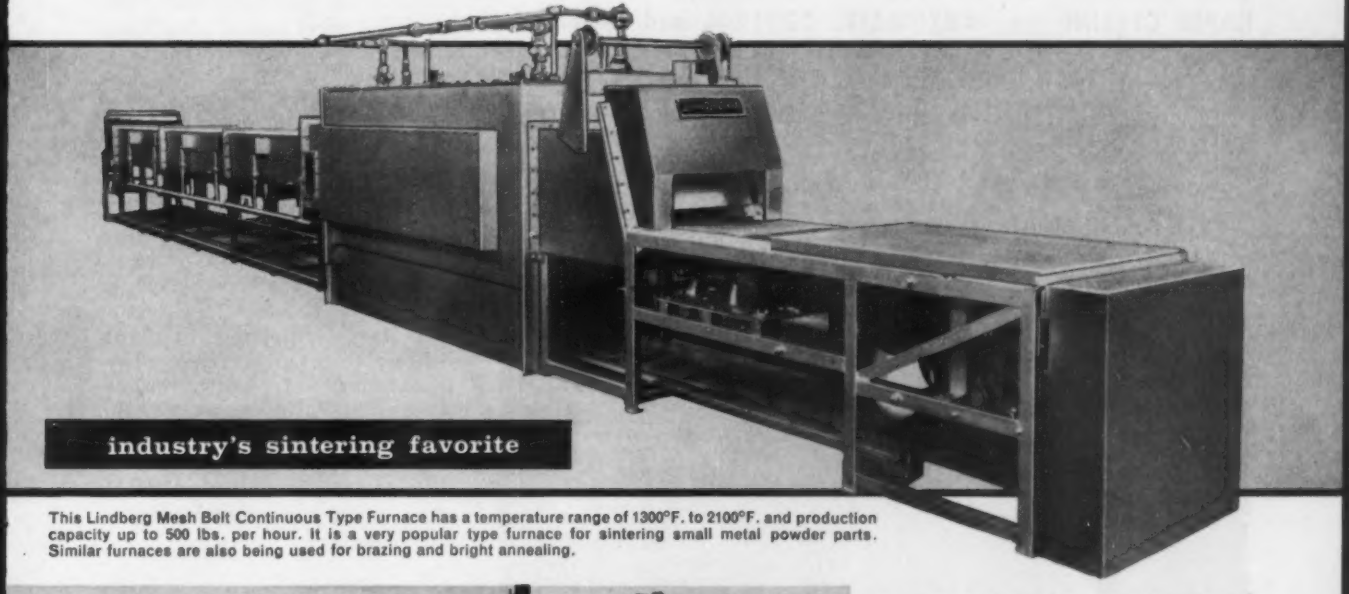
"I guess you're right. It isn't a knockoff riser"

Circle 613 on Page 39→



This new Lindberg Molybdenum Element Pusher Type Atmosphere Furnace has a maximum temperature of 3000°F. with 60KW input. It embodies high temperature refractories suitable for low dew point without muffle and is ideal for sintering stainless steel compacts in hydrogen or dissociated ammonia. Furnace provides side loading and discharge ports with purging chambers. Installation at right also shows conveniently located ammonia dissociator and control panels.

If your production processes require sintering you can depend on getting exactly the right equipment for your needs from Lindberg's comprehensive line of dependable, efficient, production-proven furnaces



This Lindberg Mesh Belt Continuous Type Furnace has a temperature range of 1300°F. to 2100°F. and production capacity up to 500 lbs. per hour. It is a very popular type furnace for sintering small metal powder parts. Similar furnaces are also being used for brazing and bright annealing.

Lindberg Roller Hearth Continuous Type Furnace handles loads up to 2200 lbs. per hour in temperature range 1300°F. to 2100°F., for bright annealing, silver brazing and sintering metal powder.

Lindberg Hand Pusher Batch Type Furnace has a temperature range of 1300°F. to 2500°F. Also sintering capacities from 25 to 300 lbs. per hour available.

For full information on the furnaces illustrated and Lindberg's complete line of sintering and brazing furnaces, just get in touch with your local Lindberg Field Representative (see classified phone book) or write direct. Please remember, too, that Lindberg offers a variety of Atmosphere Generators to provide, efficiently and economically, the proper atmospheres recommended for use with our sintering furnaces. Heat Treating Furnace Division, Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois.

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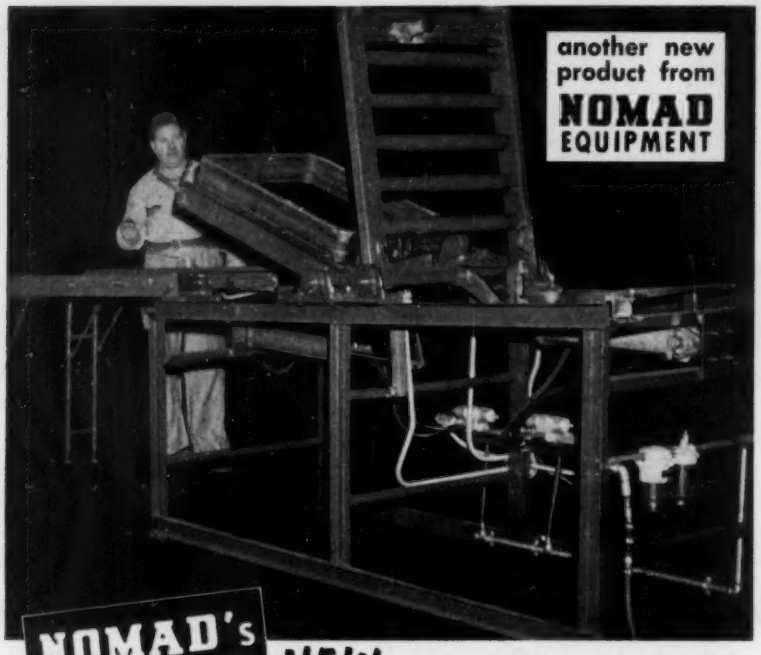

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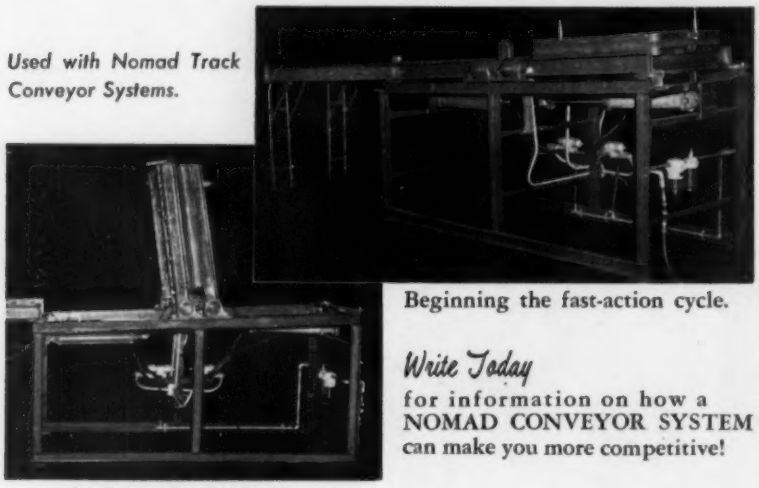

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skilled operator, puting forth his best effort, and given adequate allowances for rest and personal needs, can attain a performance of approximately 133 per cent or an 80-min. hour. For performance above the incentive line, the standard time is calculated from the productivity formula and the operator receives an additional minute of pay per hour for each additional standard minute produced.

When the direct measured minutes per hour are greater than 80, it is assumed conditions are unusually favorable. In this case, the meter measured minutes per hour are arbitrarily established at 80 and the formula becomes $S = 60 + \frac{1}{4} D$.

Working Arrangement — Before starting repair work, an inspector marks casting defects with a crayon. Then he prepares a work ticket listing the number of each defect by type and apparent magnitude. Direct measured standards are applied before repair operations start. This procedure offers several advantages.

It provides a goal or quantitative assessment of the operator's work load. Since direct standard data are available, the operator knows approximately what is expected of him. Also, it assures an accurate production count. The work tickets readily provide a check on output since all repair operations on each casting are performed by one man.

It helps inspectors decide whether to scrap or repair defective castings. Too often this decision is based on guesswork. But perhaps most important, it documents defect information. This helps to pinpoint recurring trouble spots, a step toward their eventual elimination.

Book Review

***Manual of Foundry Practice*, by J. Laing and R. T. Rolfe, hard cover, 400 pages, 8¾ x 5⅝ in., third edition, published by Chapman & Hall Ltd., 37-39 Essex St., London, W. C. 2, England. Price 50s.**

This edition has been revised to include some subjects not discussed before, such as shell molding, synthetic molding sands, the carbon dioxide process for molding and coremaking, and exothermic feeding of castings.

easy-to-use, low-cost CORE OILS now are better than ever!

Not every foundry is suited to synthetic core binders. Synthetics are often tricky to use... call for special technical skills... involve costly investment.

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Why not investigate W·G·S core oils and find out how they can solve your core problems and lower your costs? Write us about your sand mixes and shop conditions. We'll send you a trial drum — *on approval* — or have our foundry representative call.

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For More Information Circle 615, Page 39

MAN TO MAN....

By RALPH L. LEE, *President*
Lee Hobby Foundry, Birmingham, Mich.

Claustrophobia in the Foundry

"There are three kinds of people—thinkeruppers, getterdoners, and doers—and all are important to each other and society in general"

● EVER SINCE I was a kid, I'm afraid, I've suffered from a touch of claustrophobia. I always have dreaded being hemmed in, marching in a parade, singing in a chorus, or being regimented into almost any type of group activity.

In spite of the fact that I have spent most of my working life with big organizations, my bosses, who probably sensed my affliction, gave me as much latitude for free lancing as the organizations would permit. Now that I have retired to become president, patternmaker, molder, melter, and shakeout man of the one-man Lee Hobby Foundry, I find that I finally am free of claustrophobia—free to do as I please. I suspect, however, that this new freedom may be partly responsible for the red ink which far too frequently appears on the books of the Lee Hobby Foundry.

New Ideas—The trouble is that I get so steamed up about some novel idea or process that before I know it I am into it up to my neck, to the neglect of the commonplace bread and butter items.

Some time ago I met a soulmate, the interesting young manager of a neat, well equipped foundry, with more ideas than a dog has fleas. I warmed up to him right off the bat because I sensed that he was a fellow sufferer. Incidentally, this affliction isn't all suffering, by any means. At times it can be lots of fun.

This fellow is in an enviable position to have fun since the foundry is a family affair. The retired owner drops in occasionally to pass the time of day and evidently is open-minded about the ups and downs of the foundry business and the experimental zeal of his promising young foundry manager.

Although my appointment was for the purpose of visiting the foundry, we had one heck of a time getting out of the office. There was too much to talk about, and the conversation was sparked by the presence of some challenging sectioned castings. I learned that my newly made friend was a fairly new recruit to the foundry business with a splendid background of precision machine shop practice.

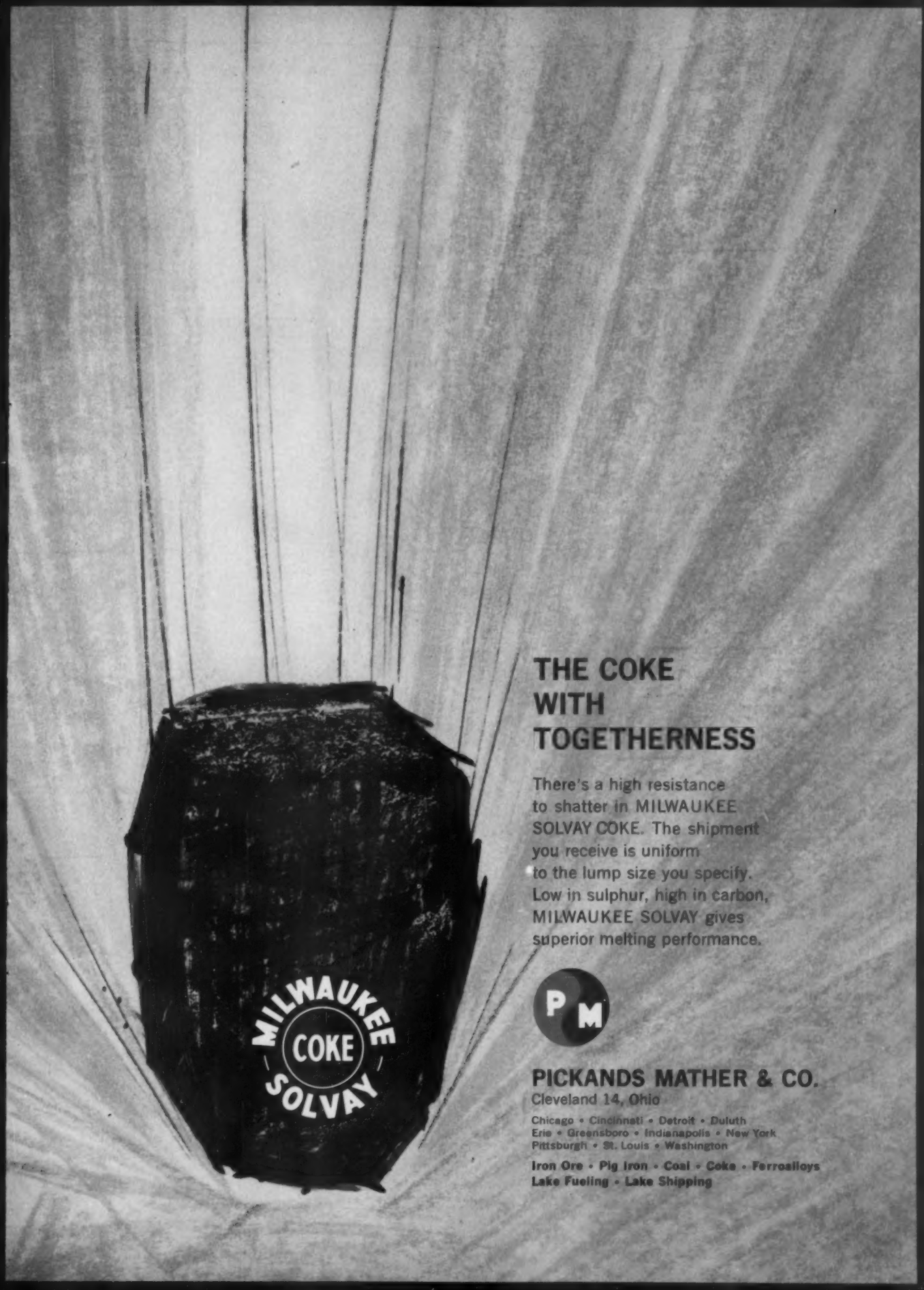
Shell and CO_2—When he first came, the shop was exclusively a green sand nonferrous foundry. Then shell molding became the apple of his eye. In a modest way, he set up to get into it while still carrying on some of the green sand operation. When he still had some distance to go with shell molding before getting it well grooved, he became fascinated by the CO_2 process.

Off to one side in the shop, he showed me a three-station stack molding setup — splendid equipment, but idle for the time being. I saw signs of the honeymoon's being over in this department. He was somewhat disappointed with the finish of the castings produced in comparison with that of the samples which had sparked his interest in the first place. Costs weren't encouraging, either.

But his eyes sparkled when he showed me his present venture. With shell molding, he's doing an ingenious job of casting around inserts, making a finished product in surprising quantities for the size of his organization and plant. As well as he is getting along in this direction, he confided in me that there is much yet to be done before this new baby is clicking along the way he wants it to go.

The Dividing Line—From what I gathered, this young fellow is none too clear from the standpoint of economics and product requirements as to just where the dividing line is which separates the legitimate zones of green sand, shell molding, and CO_2. I don't suppose that he is unique in his puzzlement,

Circle 616 on Page 39→



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For More Information Circle 617, Page 39

for these lines which separate one process from the other are more likely than not to be vague, shaded bands.

I couldn't help feel from what he told and showed me that each step he took in his forward march did not turn out quite as well as he had believed it would when he undertook it. This result is, of course, not surprising. In fact, it's customary. There always has to be a shakedown period during which the thrill of adventure and the glamour of novelty evaporate, to be replaced by grubby fact facing and troubleshooting.

There isn't much question that the instinctive urge for adventure in this ingenious young man has as much to do with his undertakings as the requirements of the business. He has accomplished one whale of a lot, and all by himself, for he has no technical or mechanically trained folks around to help him.

He must spend a great deal of his time making shell mold patterns and coreboxes, besides building fixtures and apparatus. In fact, I imagine that he can't have a lot of time left to watch and supervise those vitally important and none too interesting routine matters such as sand selection and conditioning, melting, time studies, scrap, and cost analysis.

Sand Trouble — He's going to bring me a sand sample from one of his heaps, and I'll give it the old one-two-three tests. From a couple of handfuls I grabbed during my visit, I'll bet a nickel to a doughnut that some of his molding, cost, and finish troubles in all three departments are due to sand neglect. The interesting thing to me was that the green sand bench molding he was trying to get away from still hangs on in spite of his efforts and evidently pays for a substantial portion of his expenses.

This little foundry is plugging right along, although not as fast now as it has in the past or intends to go in the future. But the point is that it's all in one piece and a going concern. That's pretty good evidence that it's serving a worthwhile need and doing most of the things that count. Sometimes it strikes me as amazing how rugged a well rooted foundry can be.

Many years ago I wrote a little booklet which had considerable distribution. It was based on the observation that from one point of view there are three kinds of people —thinkeruppers, getterdoners, and doers—and that all three were needed or vitally important to each other and to society in general. The late Boss Kettering, inventor and research head of General Motors, used to brag that he had no talent for business, but hired somebody who did have. He did just that. There evidently is a great advantage to recognizing our limitations along with our strengths.

Promotion for Mother—Since my interesting foundry visit and my acquaintance with its ingenious young manager, I have decided to promote Mother (that's my wife, Mrs. Lee, formerly treasurer of the Lee Hobby Foundry). Now she is chairman of the board, with veto prerogative. She'll be able to pull me down out of the clouds, from my flights of imagination to the realities of the much less glamorous facts of life which have to be taken into account to keep the sheriff away from the door. She never has had any patience with my complaints of claustrophobia, incidentally.

ASM Publishes New Quarterly For Latest Technical Papers

American Society for Metals has published its first edition of *Metals Engineering Quarterly*. The new periodical provides a means for timely publication of important engineering papers from national and regional Metal Congresses. Previously, only a few such papers could be published in the society's other publications.

The February issue of the *Quarterly* contains eight papers, two of which are of special interest to foundrymen. These are "Properties of Gray and Ductile Irons" by John F. Wallace and "Refinement of Aluminum-21% Silicon Casting Alloys" by Myron G. Urdea and Yeshwant P. Telang.

The *Quarterly* will be issued in February, May, August, and November of each year, and will be available to ASM members for $6 yearly and to nonmembers for $10. Foreign subscribers should add $2 for postage.

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For More Information Circle 621, Page 39

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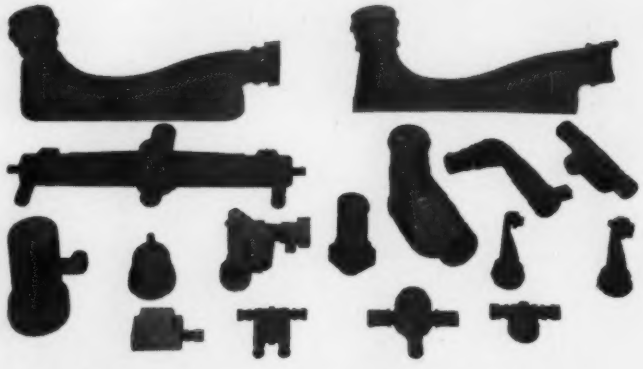
Crouse-Hinds reports on Shalco Shell Core Molding:

3 Shalcos Plus 1 Operator Produce 7,000 Cores In 7½ Hours!

Production as high as 7,000 top quality cores in one 7½ hour shift is the big reason Crouse-Hinds Co. of Syracuse, N.Y., is sold on Shalco Shell Core Molding. C. H. Alvord, New Process Engineer, explains: "We decided to try shell cores because we need extremely smooth surfaces on the inside of our electrical fittings and are always looking for ways to reduce production costs. After an extensive study of *all* shell core machines, we bought a Shalco U-180 and, because of its excellent performance, soon installed three more identical machines. With our present arrangement, three of the Shalcos are operated by one man while the fourth is being set up for the next job. With the Shalcos we can produce a wide variety of cores including those shown at right; sometimes need *three* inspectors to handle and pack production output of the *one* core machine operator!"

Efficiencies such as those described by Mr. Alvord are commonplace among Shalco users. It will pay *you* to get complete information. Call, write or wire . . . today.



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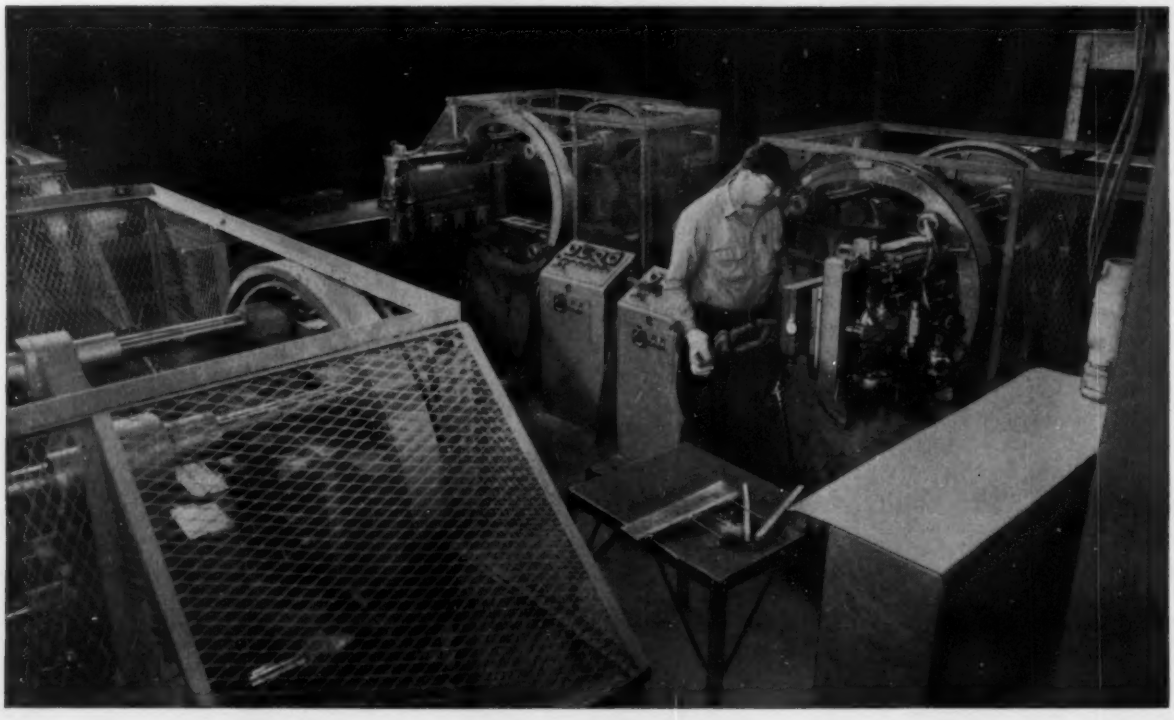

By WILLIAM G. GUDE
Editor

Operating Practices Featured at

Southeastern Regional Conference

● TENNESSEE CHAPTER, AFS, was host to some 350 registrants at the 29th Southeastern Regional Foundry Conference held at the Read House, Chattanooga, Tenn., Feb. 16-17.

In all respects the meeting lived up to the high quality long established by the oldest consecutive foundry conference of the various chapters. As in the recent past, the conference also was sponsored by the Birmingham District and University of Alabama Student chapters.

Operating practices predominated the topics of the technical program arranged by a committee under the chairmanship of James L. Payne, Tennessee Chapter vice chairman and vice president, Ross-Meehan Foundries Inc., Chattanooga. Herman Bohr Jr., Robbins & Bohr, Chattanooga, was chairman of the general conference committee.

Tennessee Chapter chairman Thomas A. Deakins presided at the annual banquet concluding the conference at which Warren Whitney, vice president, James B. Clow & Sons Inc., Birmingham, was the principal speaker.

Other events included a ladies' reception and dinner Thursday evening at which the chairman was G. Frank Anderson, Tennessee Products & Chemical Corp., and a luncheon Thursday. The latter, presided over by Mr. Payne, was addressed by Norman Dunbeck, International Minerals & Chemical Corp., national AFS president. The principal talk, given by Harry Kessler, president, Meehanite Metals Corp., recounted some of his experiences as a boxing referee, supplemented by a movie of one of the championship bouts he handled.

Friday morning was given over to visits to a dozen plants in the area. Details of the technical discussions follow:

Foundry of the Future, by Clyde A. Sanders, vice president, American Colloid Co., Chicago. Many recent developments in operating practices and equipment—a large share of which have occurred in Europe—will be incorporated in tomorrow's foundry. They include automatic shakeout, magnetic mold clamping, composite patterns, improved gating systems, vacuum inoculation, semi-automatic pouring, metal degassing, greater use of stacker cranes, and vibration of metals after inoculation to help eliminate slag.

Sand Reclamation, by C. T. Jones, sales engineer, National Engineering Co., Chicago. About 100 foundries have sand reclamation systems, the large majority of which is pneumatic equipment. Other types are the thermal and wet systems. The wet type is most effective when the sand contains combustible binders. Wet scrubbers operate best with sands having primarily a clay coating and are less effective when carbonaceous materials and vitrified clay are present.

Cost of pneumatic sand scrubbers is returned in a relatively short time through savings in new sand requirements. Actual cost of reclaimed sand depends on quality of sand required, how many hours a day the equipment is operated, and cost of moving the sand to and from the reclamation unit.

Water-Cooled Cupola Operation, by H. W. Schwengel, vice president, Modern Equipment Co., Port Washington, Wis. This type of melting unit, incorporating an unlined shell and water-cooled tuyeres, offers flexibility and control of melting, a long operating period, and low maintenance. Slag analysis is fixed because it is not affected by a refractory lining. Carbon block lining in the well has experienced a life of up to 125,000 tons of melted metal.

An analysis of an actual installation of a 78-in. cupola shows total savings of $4.57 a ton of metal over conventional melting. The savings accrue principally from substitution of steel scrap for pig iron, reduction in bed coke, fewer bottom drops, and lower refractory use.

Foundry Cost Analysis, by Harry Kessler, president, Meehanite Metals Corp. He explained how to prepare a simple break-even chart which shows the relation between costs in cents per pound to man-hours per ton of good castings for varying rates of production. Items entering into costs include labor, direct and indirect materials, and overhead. The foundry whose labor cost is 50 per cent or more of total costs can expect financial trouble.

Core and Mold Blowing, by Lawrence D. Pridmore, president, International Molding Machine Co., La Grange Park, Ill. Use of proper

vents and sufficiently large blowholes is the main consideration in coreblowing practice. There is no fixed ratio between the number of blowholes and vents, but it is important to put the vents where they are needed. Location of holes and vents also is vital when rigging for mold blowing so that the hardest sand is placed where it is wanted.

New Developments in Green Sand Molding, by T. E. Barlow, sales manager, Eastern Clay Products Div., International Minerals & Chemicals Co., Skokie, Ill. Control of mold wall movement has received increasing attention in recent years, and the tendency is to work toward development of as strong a sand as possible. Studies have indicated how widely various sand additives —such as seacoal, cereal, and flowability additives—affect sand properties depending on whether the bond is western bentonite, southern bentonite, or fireclay. Results of these tests were described in detail by the speaker.

Carbon Control in Acid Melting, by W. W. Levi, consultant, Radford, Va. Good carbon control is one of the requirements of quality control, and percentages of silicon and phosphorus in the iron at the cupola spout have an important bearing on carbon pickup during melting. Consequently, percentages of these elements and of carbon in the charge must be known. Development of an equation for calculating percentage of total carbon in the iron at the spout was described.

Aluminum Risering, Feeding, Degassing, by Donald Wyman, sales manager, Exomet Inc., Conneaut, Ohio. Porosity, a major problem in production of aluminum castings, can be reduced by vacuum degassing the molten metal, bubbling chlorine or nitrogen through the metal, or chemical additions to the melt. Equipment is available to indicate before pouring how much gas is in the melt. With that information, the foundryman can degas his metal properly.

In controlling grain size, use of boron and titanium together offers some advantage in improving tensile properties compared with titanium addition alone.

When using exothermic or insulating type materials to delay aluminum riser solidification it should be remembered that most of the heat loss from the riser is through the sand, instead of from the top as in the case of ferrous metals. Consequently insulating sleeves are more effective than topping.

Snagging and Cutoff Cost Reduction, by John A. Mueller, Bonded Abrasive Div., the Carborundum Co., Niagara Falls, N. Y. Snagging and cutoff costs can be reduced substantially by proper wheel selection and use of most efficient speeds and feeds.

These costs are influenced by wheel grit size, wheel speed, reduction of wheel diameter, wheel-work pressure, hardness of metal being ground, production rate of grinding, and power available to do the grinding.

Particularly significant is the relation of labor plus burden cost and grinding wheel cost to the total cost of grinding. Performance data show that grinding costs can be reduced through use of faster cutting but shorter lived grinding wheels.

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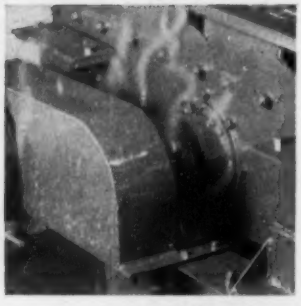

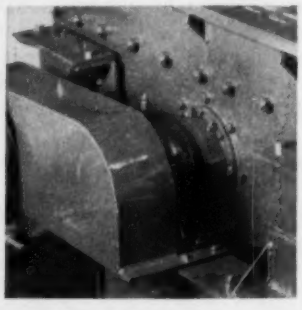

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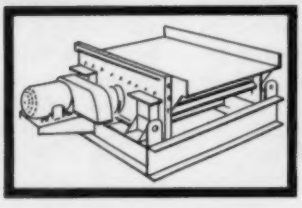

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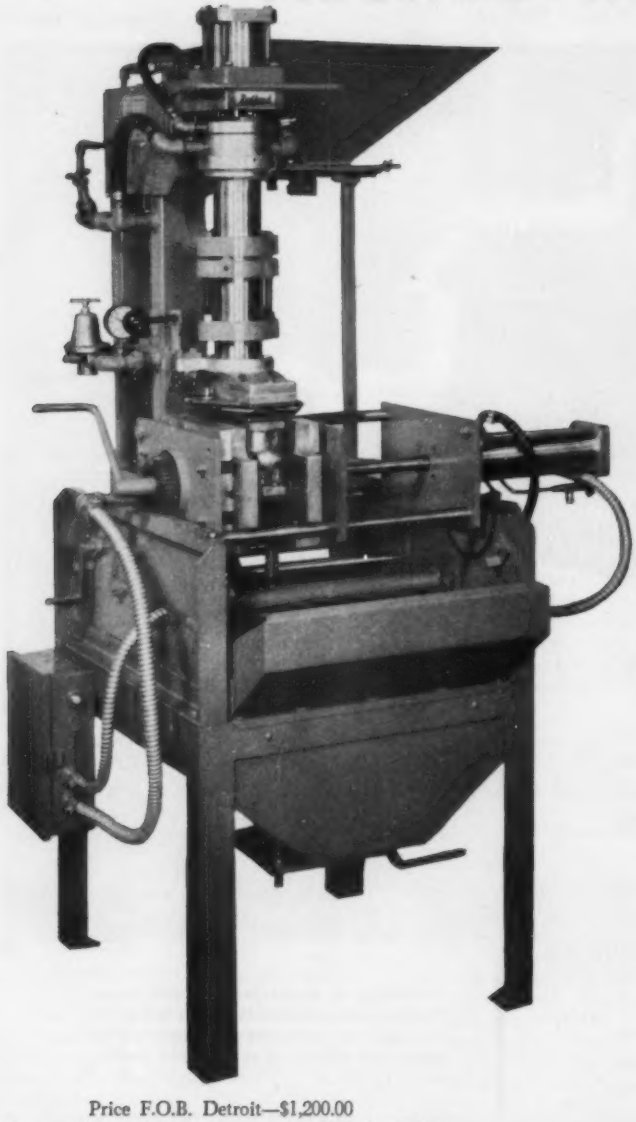

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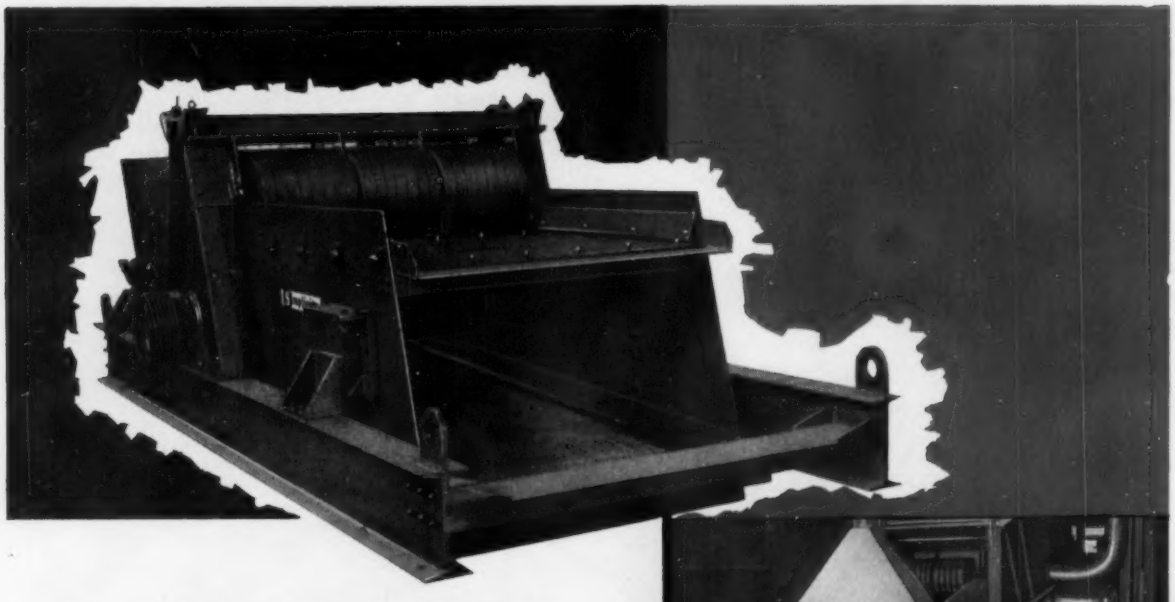

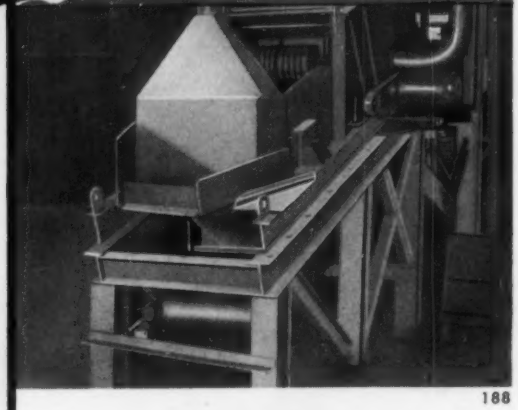

188

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For More Information Circle 622, Page 39

LITERATURE for foundrymen

For More Information, Use Reader Service Card—Page 39

Olivine Aggregate

Bulletin 60-2 explains uses of olivine aggregate in the nonferrous foundry. Tables show typical olivine molding sand mixtures, core mixtures, and olivine shell mixtures.—**Northwest Olivine Co.**, 922 Seaboard Bldg., Seattle 1, Wash.

For More Details Circle No. 408—Page 39

Bulk Handling Conveyor

Brochure TV-98 gives details about Tube-Veyor, a totally enclosed bulk handling conveyor. Unit can be fed and discharged in as many points as desired. Illustrations and diagrams show practical applications.—**Prab Conveyors, Inc.**, 30121 Grosesbeck Highway, Roseville, Mich.

For More Details Circle No. 409—Page 39

Rust Removal and Prevention

Bulletin 16B discusses methods of removing rust from raw stock and prevention of rust while parts are being processed. Sheet also covers various common industrial problems such as washing of parts by machine or tank immersion and anti-rust conditioning of steel in preparation for painting.—**Oakite Products, Inc.**, 127B Rector St., New York 6, N. Y.

For More Details Circle No. 410—Page 39

Wire Rope

Bulletin 60100 catalogs and describes company's new wire rope design. The booklet explains the advantages and uses of this wire rope and lists other bulletins available describing slings and assemblies. —**Macwhyte Wire Rope Co.**, Dept. P.R., 2900 14th Ave., Kenosha, Wis.

For More Details Circle No. 411—Page 39

Dust Collection

Bulletin contains information on various types of dust collecting, recovering, and classifying systems. Design and construction requirements, plus examples of application, also are discussed in the 4-page bulletin.—**Buell Engineering Co., Inc.**, 123 William St., New York 38, N. Y.

For More Details Circle No. 412—Page 39

Belting

Brochure covers conveying and elevating operations in its descriptions of eight different types of belting for casting conveying and elevating. Literature also includes tips on ways to increase belt life, prevent creasing, and otherwise secure better service from the belts.—**Imperial Belting Co.**, 1750 South Kilbourn Ave., Chicago 23, Ill.

For More Details Circle No. 413—Page 39

pH Meters

Bulletin 720-C describes and illustrates two styles of pH meters which measure over the full 0 to 14 pH range or make millivolt measurements from 0 to ±420 mv.—**Beckman Scientific & Process Instruments Div.**, Technical Information Dept., 2500 Fullerton Rd., Fullerton, Calif.

For More Details Circle No. 414—Page 39

Couplings

Bulletin 4100 explains and illustrates torsionally resilient Steelflex couplings. Charts and tables contain engineering data on unit's grid-groove coupling design.—**Falk Corp.**, Box 492, Milwaukee 1, Wis.

For More Details Circle No. 415—Page 39

Vacuum Melting

Bulletin 4-25 tells the story of vacuum metallurgy. Included are technical data charts and construction details for vacuum arc melting, vacuum induction heated, induction heated sintering and heat treating, vacuum resistance heated, direct resistance heated, and indirect resistance heated furnaces.—**Consolidated Vacuum Corp.**, 1775 Mt. Read Blvd., Rochester 3, N. Y.

For More Details Circle No. 416—Page 39

Did You Miss These?

Here is a list of popular literature items offered in recent months:

SAND BINDER (Bulletin KK-20) — G. E. Smith Inc., Pittsburgh 16, Pa. Circle 402, Page 39.

SHELL CORE MACHINES (Bulletin SC-1)—Osborn Mfg. Co., Cleveland 14, Ohio. Circle 403, Page 39.

CASTABLE CERAMIC FIBER—Carborundum Co., Ceramic Fiber Project, Research & Development Div., Niagara Falls, N. Y. Circle 404, Page 39.

FERROALLOYS—Vanadium Corp. of America, New York 17, N. Y. Circle 405, Page 39.

GATED ZINC DIECASTINGS—American Smelting & Refining Co., New York 5, N. Y. Circle 406, Page 39.

ALUMINUM ALLOYS—Apex Smelting Co., Chicago 12, Ill. Circle 407, Page 39.

Fire Fighting Equipment

1961 edition of "Interior Fire Fighting Equipment Catalog" provides information on portable fire safety equipment. Illustrated catalog form S-62FPB also includes engineering and specification data on accessory equipment.—**Fyr-Fyter Co.**, 221 Crane St., Dayton 1, Ohio.

For More Details Circle No. 417—Page 39

Castable Refractory

Literature contains information on a hydraulic castable refractory, shows where it may be used, shipping details, ultimate strength data, chemical analysis, physical properties, and installation data.—**H. K. Porter Co. Inc., Refractories Div.**, Porter Bldg., Pittsburgh 19, Pa.

For More Details Circle No. 418—Page 39

Poppet Valves

Digest Catalog 60-2 presents line of poppet-type valves. Cutaway drawings show construction features, sealing arrangements, and flow patterns.—**Hoffman Valves, Inc.**, 2360 West Dorothy Lane, Dayton 39, Ohio.

For More Details Circle No. 419—Page 39

Diecasting Lubricants

Brochure contains sheets describing each of company's grades of diecasting lubricants. Sheets list type of lubricant, directions for use, and the advantages of each.—**G. W. Smith & Sons Inc.**, 1700 Spaulding Rd., Dayton 32, Ohio.

For More Details Circle No. 420—Page 39

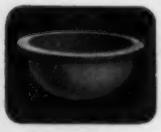
Platform Truck

Form No. F-4A-4 points out specifications of F-40A Prime-Mover industrial platform truck. Illustrations feature truck's 4000-lb capacity deck, torque converter drive, and optional equipment.—**Prime-Mover Co.**, P. O. Box 340, Muscatine, Iowa.

For More Details Circle No. 421—Page 39

Air Conditioners

Bulletin AC-100 describes new line of central station air conditioning units and features a selection of filters. The booklet covers both horizontal and vertical



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INGOT MOLDS

Special Alloy

EXTENDS LIFE . . . NO HOT SPOTS!

Acme melting pots and ingot molds assure even heat distribution without hot spots . . . they improve non-ferrous casting quality and put a damper on rejects. Cast of a specially-developed iron alloy, Acme pots and molds provide great strength and unusual resistance to high temperatures, too. As a result they consistently reduce down time and substantially cut replacement costs.

Stocked in forty sizes and a complete range of styles, you can standardize on Acme melting pots and molds and be confident of immediate shipment at all times! Take advantage of all these benefits . . . proven over a period of more than 30 years.

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For More Information Circle 623, Page 39

models in 14 basic sizes with 24 different arrangements for each size.—**American Air Filter Co.**, Dept. PD, 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 422—Page 39

Rubber Products

Information is included in 24-page catalog M5 on V-belts, transmission belt, conveyor belt, hose, and flexible rubber pipe and joints, plus a summary of molded and extruded products.—**Manhattan Rubber Div.**, Raybestos-Manhattan Inc., Passaic, N. J.

For More Details Circle No. 423—Page 39

Abrasive Discs

Brochure describes new sanding disc employing unique abrasive grain-resin bond system. It includes a performance factor chart to aid in selection of the proper disc for each particular job.—**Carborundum Co.**, P. O. Box 337, Niagara Falls, N. Y.

For More Details Circle No. 424—Page 39

Brakes

Four-page Bulletin GEA-1518D features pictures, drawings, and engineering data concerning Thrustor and solenoid-operated spring-set brakes for use with alternating or direct current motors.—**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 425—Page 39

Dry Ice Converters

Folder describes and illustrates several models of units to convert dry ice to carbon dioxide gas or liquid. Capacities range from 25 to 1000 lb.—**Marison Co.**, Box 178, South Elgin, Ill.

For More Details Circle No. 426—Page 39

Load Indicator

Leaflet includes description and information about testing unit for measuring loads up to 10,000 lb.—**Research Products Co.**, P. O. Box 1047, 1415 Third St. South, St. Petersburg 31, Fla.

For More Details Circle No. 427—Page 39

Vibrating Shaker

Bulletin 34-C features a vibrating shaker utilizing two offset weights rotating simultaneously in opposite directions. Auxiliary equipment also is shown.—**Ajax Flexible Coupling Co.**, Westfield, N. Y.

For More Details Circle No. 428—Page 39

Infrared Heating Unit

Folder features several models of gas-fired infrared generators for area heating.—**Van Dorn Iron Works Co.**, 2685 E. 79th St., Cleveland 4, Ohio.

For More Details Circle No. 429—Page 39

Wetting Agent Systems

Literature package includes discussion of advantages of wetting agents used in foundry sands and a brochure describing systems for adding those agents to sand in preparation and conditioning units. Other applications also are suggested.—**Aquadyne Corp.**, 89 Terminal Ave., Clark, N. J.

For More Details Circle No. 430—Page 39

Pushbutton Stations

Brochure gives design information on three related lines of pushbutton stations and control units. It also describes pushbutton units, selector switch units, standard pilot lights, and push to test pilot lights.—**Clark Controller Co.**, 1146 E. 152nd St., Cleveland 10, Ohio.

For More Details Circle No. 431—Page 39

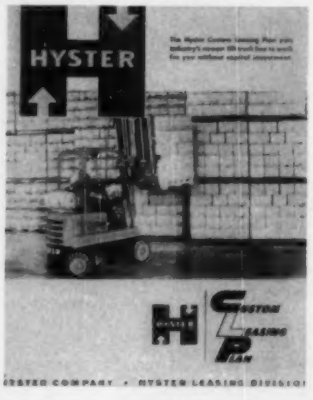
Flexible Hoses

Twelve-page Bulletin 605 contains selection data, installation information, and prices of flexible hoses for moving air, dust, fumes, and materials.—**Flexaust Co.**, division of Callahan Mining Corp., 100 Park Ave., New York 17, N. Y.

For More Details Circle No. 432—Page 39

Truck Leasing Plan

Booklet explains five programs available under company's custom leasing plan for



industrial trucks.—**Hyster Co.**, Hyster Leasing Div., P. O. Box 4318, Portland 8, Oreg.

For More Details Circle No. 433—Page 39

Furnace Burners

Bulletin H-42 describes nine sizes of burners for such applications as metal melting and heat treating. Special design permits them to be used with preheated combustion air and/or oxygen enriched air.—**Combustion Div., Eclipse Fuel Engineering Co.**, Rockford, Ill.

For More Details Circle No. 434—Page 39

Metal Cleaning and Finishing

Brochure called "Wheelabrator Worldwide" describes services and equipment designed to help U. S. manufacturers with overseas operations to set up effective and economical metal cleaning or finishing departments. Pictures depict various types of equipment for metal cleaning operations and dust and fume control.—

NOW!

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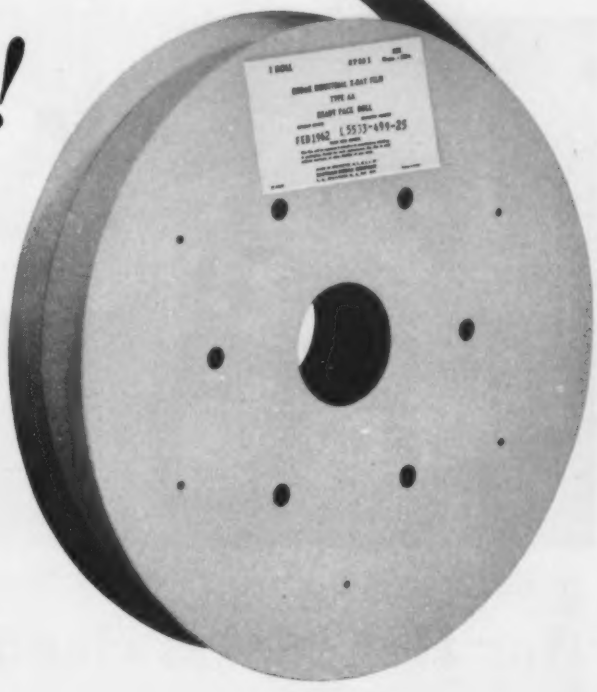

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Here is America's preferred Industrial X-ray Film in a new convenient form—in 200-foot rolls, and in three widths. Ready Pack rolls are the answer for panoramic or moving slit methods of radiography of thin-wall vessels and pipe, honeycomb, circumferential welds, etc. Unroll the needed film, cut it off, seal the ends with opaque, pressure-sensitive tape. You are ready to inspect aluminum or magnesium alloys, thin steels or anything where lead screens are not required.

Ready Pack rolls are supplied on cardboard cores, 12 inches in diameter. The film is enclosed in a light-tight wrap-around sealed covering, without interleaving paper. It keeps clean and does away with darkroom loading. For processing, just separate the wrap along the sealed edge and remove the film.

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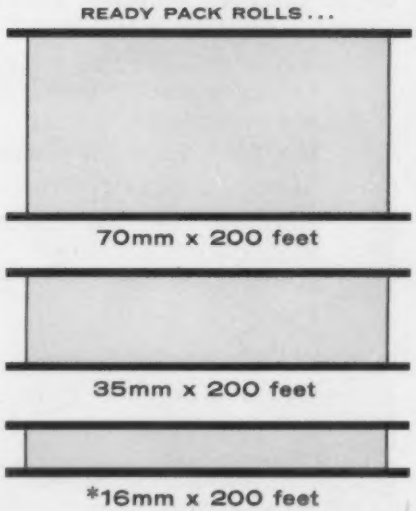

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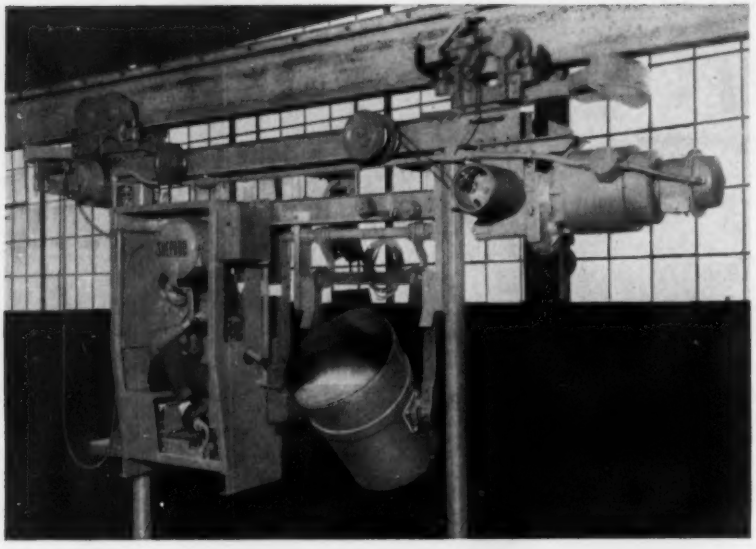

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It only takes **one man** to move and pour hot metal — swiftly and safely — with a Shepard Niles Hot Metal Carrier. And because each carrier is **JOB-MATED** — built with the components best suited to meet **your** exact on-the-job conditions — it will last longer, require minimum maintenance and practically no downtime. Care like this in our plant means significantly lower cost operation in yours.

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1373 Schuyler Ave., Montour Falls, N.Y.

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For More Details Circle No. 435—Page 39

Industrial Fans

Illustrated brochure covers radial blade and forward curved industrial fans. Also included in the line are cycloidal exhausters, non-overloading, and small exhaust fans.—**Garden City Fan & Blower Co.**, 801 North Eighth St., Niles, Mich.
For More Details Circle No. 436—Page 39

Aluminum Degassing

Leaflet B-2 discusses how problem of gas porosity in aluminum castings can be reduced by use of Foseco Degaser. Properties of the four grades of degaser, and tabulated application data also are contained in the bulletin.—**Foundry Services, Inc.**, P. O. Box 8728, Cleveland 35, Ohio.
For More Details Circle No. 437—Page 39

Safety Equipment

Brochure 0300-1 describes eye and face protection for a variety of industrial applications. The 40-page catalog also discusses vision testing equipment, goggles, face shields, welding helmets, and accessories.—**Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa.
For More Details Circle No. 438—Page 39

Permanent Magnetic Drums

Bulletin MD-200 describes permanent magnetic drums, including enclosed units, for automatic removal of tramp iron or ferrous material from sand.—**Homer Mfg. Div., Ohio Electric Mfg. Co.**, Lima, Ohio.
For More Details Circle No. 439—Page 39

Metal Buildings

Illustrated, 16-page catalog presents line of pre-engineered metal buildings for industrial use. Units are available in a variety of styles and sizes and feature construction without interior columns.—**Buildings Div., Parkersburg Rig & Reel Co.**, Parkersburg, W. Va.
For More Details Circle No. 440—Page 39

Clamping Cylinders

Illustrated, 4-page Bulletin 91036 lists specifications, outstanding features, ordering data and dimensions of clamping cylinder line. Offered are base and foot-mounted units in bore sizes 1½, 2¼, and 3 in.—**Airmatic Valve, Inc.**, 7313 Associate Ave., Cleveland 9, Ohio.
For More Details Circle No. 441—Page 39

Blast Cleaning Barrels

Bulletin 706 contains information on specifications and dimensions of five sizes of standard-duty blast cleaning barrels. Case histories show how units have created substantial profits. — **Pangborn Corp.**, Hagerstown, Md.
For More Details Circle No. 442—Page 39

You Pour Clean Pure Metal if you're using

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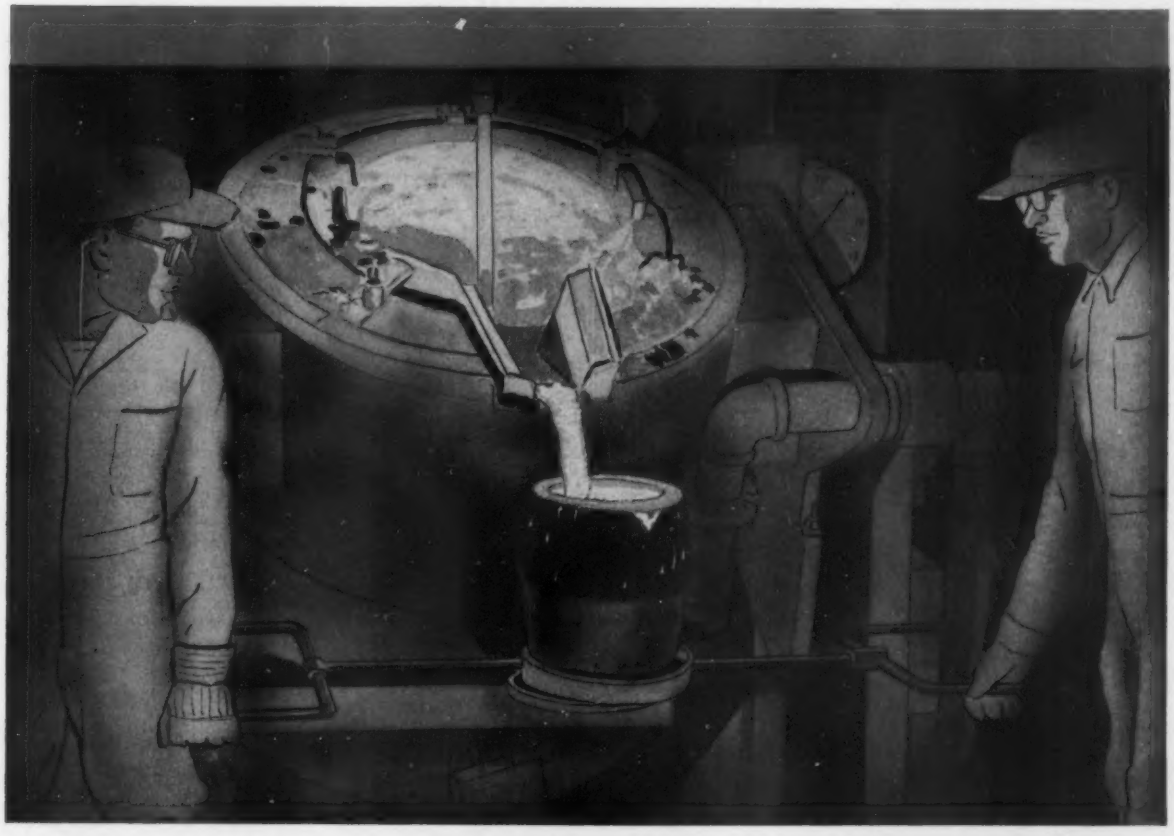
ALUMINUM FLUX

Just a small amount in melting pot or crucible and castings are stronger, free of spongy spots and take a higher polish.

- Use more scrap per charge and still get clean aluminum.
- Prevents fumes or obnoxious gases.
- Metal won't cling to the dross and crucible linings are clean.

For any fluxing problem—gray iron, brass or aluminum, ask for a Cleveland Flux metallurgist to give you a hand — He's waiting to serve you.

Write or call now!



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SIPAC is a non-carbonaceous and inert core coating that will not react with any molten metal, including gray iron and steel. It improves casting quality by completely protecting core surfaces. SIPAC resists flaking, and, with only the addition of water, produces a bright, gold-colored coating that makes cores highly visible, aiding in placement of cores in the mold. SIPAC is ready for mixing and thinning to your desired Baumé . . . without settling. For castings with smooth surfaces, always specify SIPAC . . . available only in paste form in 55 gallon drums.

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Variety Marks Topics at

Wisconsin Regional Conference

● UNSETTLED business conditions had little effect on attendance at the 24th annual Wisconsin Regional Foundry Conference, held at the Schroeder Hotel, Milwaukee, Feb. 8-10. Approximately 600 members and guests were present at the 20 technical sessions, two luncheons, and the annual banquet.

Topics discussed at the technical sessions included heat treatment, analysis, reliability, casting quality, machinability, melting, core practices, and binders. First day of the meeting was devoted to a trip through the assembly plant and shell mold foundry of Evinrude Div., Outboard Marine Corp., Milwaukee.

At the opening session, Dean Kurt Wendt, University of Wisconsin, Madison, Wis., discussed **The New Emphasis on Materials Research** and pointed out that the present state of knowledge holds back progress in the space age. The growth of solid state science, however, is making possible the creation of new materials from knowledge of the basic theory of elemental factors and improvement of the old materials.

H. M. Patton, American Hoist & Derrick Co., St. Paul, and regional vice president of AFS, spoke briefly on the activities of the society and stressed the research being carried on. Currently, a research program on gating of diecastings is being organized in co-operation with the American Die Casting Institute and the American Zinc Institute.

Jack H. Schaum, *Modern Castings*, Chicago, spoke on "New Market Opportunities for Metal Castings." and indicated that close attention should be given to improving production methods to meet price and quality competition. He also stressed the need for research. The foundry industry is expending only 0.03 per cent of castings' sales value as compared with the general industry figure of several per cent.

Sessions on gray iron dealt with heat treatment, spectroscopic analysis, reliability, and chip injection into the cupola. **Heat Treatment of Cast Iron,** by Marvin Evans, consultant—Through heat treatment, the current use of gray cast iron can be expanded considerably. Such properties as hardness, modulus of elasticity, ductility, magnetic permeability, machinability, stability, resistance to growth, and damping capacity can be modified appreciably. Heat treatments include types for stress relief, spheroidizing, full annealing, and hardening.

Stress relieving involves heating standard cast iron to 800 to 1100° F and alloy cast iron to 1200° F, holding, and then slowly cooling in the furnace to 500° F. Temperature for spheroidizing is 1200 to 1500° F, depending on iron composition, followed by holding and slow cooling in the furnace. Annealing for complete softening is carried out at 1600 to 1750° F. Treatment for hardening is the same as for annealing, but after uniform temperature has been reached, the castings are quenched in water, oil, or molten salts. Then the castings are drawn or tempered at 400 to 1000° F, depending on final hardness desired.

Foundry Control of All Elements in Cast Iron with the Quantovac, by Allan Goldblatt, Applied Research Laboratories Inc.—Incorporation of vacuum chambers in a direct-reading spectroscope permits the determination of such elements as S, C, P, in addition to the usual metallic elements such as Si, Mn, Ni, Cr, Mo, etc. The speaker discussed application of such a unit in gray iron foundries. Details of this use are presented in "Vacuum Spectrometer Aids Gray Iron Foundry Control," by E. L. Roth and George Antonic, FOUNDRY, March, 1961, Page 149.

Reliability as It Pertains to a Foundry, by C. E. Drury, Central Foundry Div., General Motors Corp., Saginaw, Mich.—The speaker defined reliability as the probability that a product will do what it is supposed to do, when and as long as it is supposed to do it, under conditions to be encountered. He presented a short, cartoon-type film. "Growing with McGrew" which portrayed the difference between quality and reliability.

Since a final product usually is an assembly of parts, its reliability depends on the reliability of each of the separate parts. Since castings often form parts of assemblies, they must possess reliability.

The foundry must concern itself with compatability of part design to the foundry process, the material and heat treatment specifications for meeting the function, and the entire process of purchasing and receiving material, melting, pouring, molding, heat treating, finishing, and final inspection. After those

specifications have been agreed upon, the effort in the foundry is centered around the reliability of the various processes in meeting the specifications.

A reliability program depends on effective use of human resources and includes training and communications, research and development, pre-production engineering control, incoming material control, process control, final quality control, customer follow-up, and evaluations.

Pneumatic Chip Injection by the Roxy Process, by George W. Anselman, Anselman Foundry Services, St. Charles, Ill.—Proper place to inject is just above the melting zone—from the upper edge of the melting zone to about 2 in. above. The atmosphere is almost neutral there, and borings melt rapidly, without loss of silicon or carbon other than the normal melting loss with top charging.

Good cupola operation is a requisite, and the borings' analysis must be known. Rusty or contaminated borings can cause trouble. With good control, up to 10 per cent of borings can be used without additional choke charge. Particle size of the chip does not affect the amount that can be put in, but not more than 60 per cent should go through a 20-mesh screen. Very large chips may show a slight increase in silicon and carbon loss. Steel chips must be crushed.

Sessions on steel castings concerned aircraft quality, temperature measurment, machinability, and molding. **Aircraft Quality—What and How**, by John Varga Jr., Battelle Memorial Institute, Columbus, Ohio—Requirements for steel aircraft and aerospace castings include close dimensional tolerances, thin sections, good surface finish, and internal soundness that will meet the desired performance requirements.

Good surface finish aids maintance of proper dimensional tolerances and elimination of potential stress raisers in the casting surface. The need for "internal soundness that will meet the requirements" may be new terminology to many foundrymen. It means that castings may be supplied with some discontinuities. Basis of judgment is stress levels in various parts of the casting. Obviously, a highly stressed casting member requires 100 per cent soundness.

The foundryman interested in producing aerospace-quality castings must know the capability of his own particular process and be able to state that he can produce the casting. He must have 1) a casting engineer or some one else on the staff who understands the problems and requirements of the aerospace industry, 2) a process capability to do the required job, 3) the best quality control procedures attainable, combined with an up-to-date knowledge of the various standards, and 4) ability to apply these factors correctly.

What's New in Pyrometry, by Douglas Johnston, Wheelco Industrial Instruments Div., Barber-Colman Co., Rockford, Ill.—The speaker described the nature, application, and limitations of permanent thermocouple and disposable-cartridge dip sticks, the total radiation pyrometer type of dip stick, and optical pyrometers.

Total radiation pyrometers are impractical for pots or crucibles because of slag formation, and they are at some disadvantage in pouring streams. Effects of emissivity on steel pouring temperatures were discussed in relation to the various types of pyrometers. The discussion concluded with a description of the recorders used with different pyrometers.

Machinability of Steel Castings, by Edward J. Wellauer, Falk Corp., Milwaukee—Machinability is the evaluation of such metal removal characteristics as tool wear, tool setup, tool material, material to be machined, etc. Obviously, metallurgical structures such as ferrite, pearlite, martensite, etc.; the grain size; and deoxidation practices in relation to inclusions are important. Different types of machining operations require different metallurgical structures to produce the best results possible. The foundry should learn from the customer what is desired and adjust its practices accordingly.

Recent Innovations in Steel Molding, by Lester B. Knight, Lester B. Knight & Associates Inc., Chicago—Any foundry needs to achieve an adequate profit, yet remain competitive. No foundry is equipped to serve the entire range of sizes, types, and alloys of steel castings with adequate profit. Therefore, it is prudent to concentrate sales effort on work best suited for the facilities and manpower capabilities and to do a real sales engineering job to provide a piece that will serve the function more economically than any other method of making it.

It is fundamental to know costs and to analyze drawings and specifications to rig the job for the highest productivity and lowest costs, plus the profit for an adequate return. This profit is considered to

INDIAN TRAINEES: D. E. Best, left, and K. H. Kostenbader, right, Bethlehem Steel Co., Bethlehem, Pa., introduced three Indian students at a meeting of Philadelphia Chapter, AFS. These men, in training at the Bethlehem plant, are, left to right, R. N. Mandal, S. Janakiraman, and S. K. Mukhopadhyay. (Photo courtesy E. C. Klank)

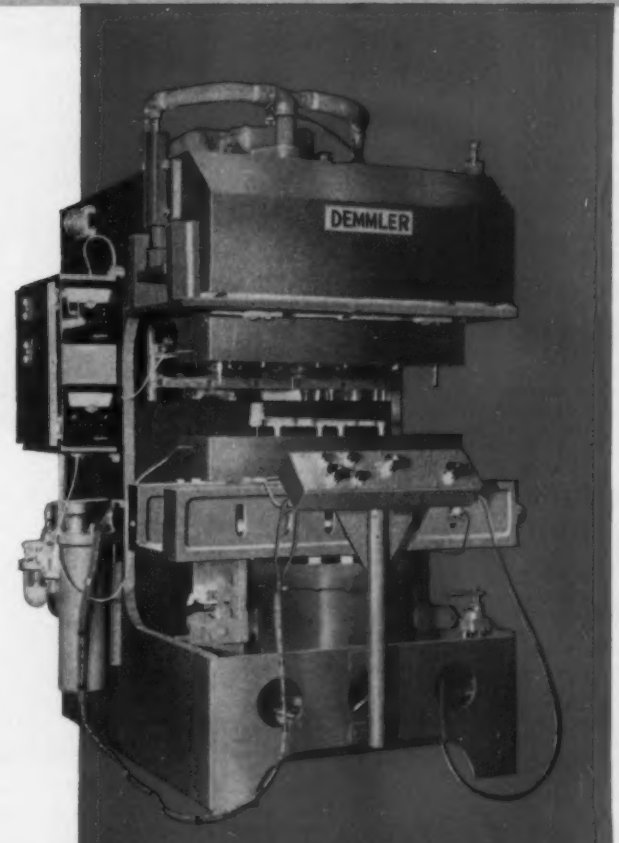
DEMMLER

simplicity
flexibility
dependability

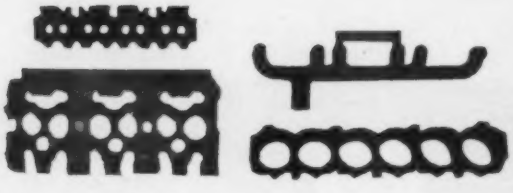
EDGE-BLOW CORE BLOWER

designed to blow furfuran or phenolic resin mixtures into gas-heated, temperature-controlled core boxes

DEMMLER advance-engineering has produced this high-production, low-maintenance edge-blow core blowing machine with fully-automatic cycle. Versatile, it blows cores from pin-type to 48" long. A new ejector feature lifts cores from core box easily without breakage. No rapping or vibration required. Its large capacity blow valve and air-receiver permits core-blowing pressures to 100 psi. Available in three sizes to fill a wide range of applications. Wire or write for additional details and quotation.



Typical cores produced by DEMMLER Edge-Blow machine:



DEMMLER Manufacturing Company
Kewanee, Illinois

For More Information Circle 628, Page 39

be 20 to 25 per cent of the total investment.

This aim requires modern facilities designed for maximum productivity, flexibility, efficient work handling—and an adequate organization with clearcut responsibility and commensurate authority. There must be realistic standards for the work content of all operations, with cost centers that permit collection of costs to reflect actual conditions and a realistic cost system for pricing, budgeting, labor control, scheduling control reports, and, most important, profit control by advance planning. People, not facilities, determine the degree of success of an operation.

Recent Innovations in Steel Molding, by Prof. R. W. Heine, University of Wisconsin, Madison, Wis.—Exclusive of the specialty field, no new materials are seen as becoming available for steel molding, but better use of known materials is probable. In this category is more use of chemically bonded green sands, mold coatings, and additives. There is likely to be increasing use of carbonaceous additives, such as 0.25 to 1.0 per cent graphite. Better use will be made of green sand, with better formulation of the materials. To make good green sand molds, good patterns are needed. Requisites of a good mold include uniform bulk density, high bulk density, high mold hardness, and good mold edges.

Nonferrous foundrymen heard discussions on air-setting cores, economical production, plastic core binder, and new light metals. **New Air-Set Cores and Practices,** by Edward Koglin, G. E. Smith Co., Pittsburgh—Cold or air-setting materials provide an answer to the foundryman's search for a sand binder which not only eliminates some of the rigors of core and mold making, but has easy shakeout and retains dimensions during baking. Such binders can be defined as proprietary materials, combining both oxidation and polymerization processes on a combination of oils and containing chemical additives so that the final product, when activated with peroxide-containing materials, will gel or set in a predetermined time.

Advantages of cores made by the cold set process were enumerated as follows: No ramming necessary because of high flowability; reduced rodding; skilled labor reduced; less finishing; uniform hardness; dimensional accuracy; reduced baking time; faster closing of molds; better shakeout; reduced rough cleaning of castings, and lower machining costs.

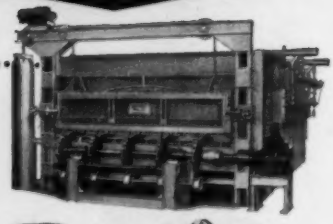
On the other hand, the sand mix has limited life, and the process is limited to core production that normally requires no more than six or eight cores per box.

Producing High-Quality Nonferrous Castings Economically, by Alfred B. Steck, Wehr Steel Co., Milwaukee—Teamwork is essential in accomplishing this objective and involves consideration of a number of factors. Quality status to fit need of application should be examined as well as the type of alloy and its characteristics, including shrinkage, gassing tendencies, mode of solidification, etc. From them, the gating system, need for chills, etc., to establish proper temperature gradients for producing sound castings

One name for all FOUR!

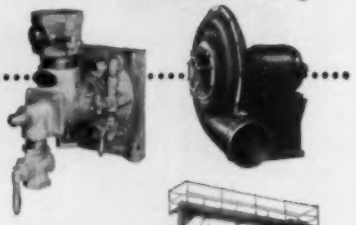
1. NEW FURNACES

CAR TYPE for annealing, normalizing, stress relieving • FORGING • METAL MELTING • SPRING FURNACES • HEAT TREATING • POT FURNACES • CONTINUOUS FURNACES



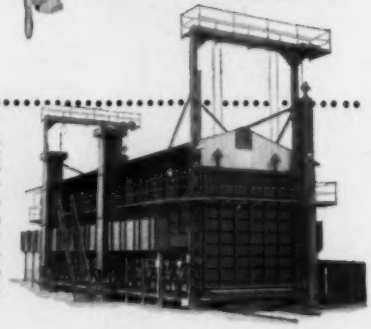
2. COMBUSTION COMPONENTS

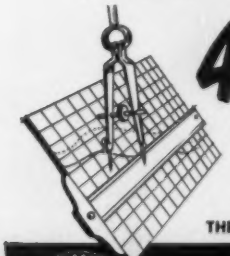
• GAS BURNERS • OIL BURNERS • BLOWERS • LOW PRESSURE BURNERS • HIGH PRESSURE BURNERS • AUTOMATIC CONTROLS • TORCHES



3. ENGINEERING SERVICE

This 16′ x 80′ x 18′ car-type, stress relieving and normalizing furnace employs 52 JOHNSTON oil burners. Six program-type electronic instruments control temperature in a range from 1150 to 2150°F. It was engineered by JOHNSTON and built under JOHNSTON supervision with labor and materials furnished by purchaser.





4. FURNACE REBUILDING

You may not need a new furnace. JOHNSTON re-engineers, re-builds to present day standards, with our labor or yours, at our plant or yours, including jet re-circulating systems, and to meet air corps and other government certification.

THE NAME IS ... OVER 35 YEARS EXPERIENCE

JOHNSTON MANUFACTURING CO. 2825 EAST HENNEPIN AVE. MINNEAPOLIS 13, MINN.

ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

WRITE FOR FREE BULLETIN... 1102R

"Forgot we even had that one"

That's a typical reaction of Gardner-Denver air compressor owners when they check on compressed air costs. But this heavy-duty compressor never forgets. It keeps delivering dependable air power—on a continuous basis. Write for Bulletin HAC-40.

Gardner-Denver Company, Quincy, Ill.—Offices in principal U.S., Canadian and Mexican cities.
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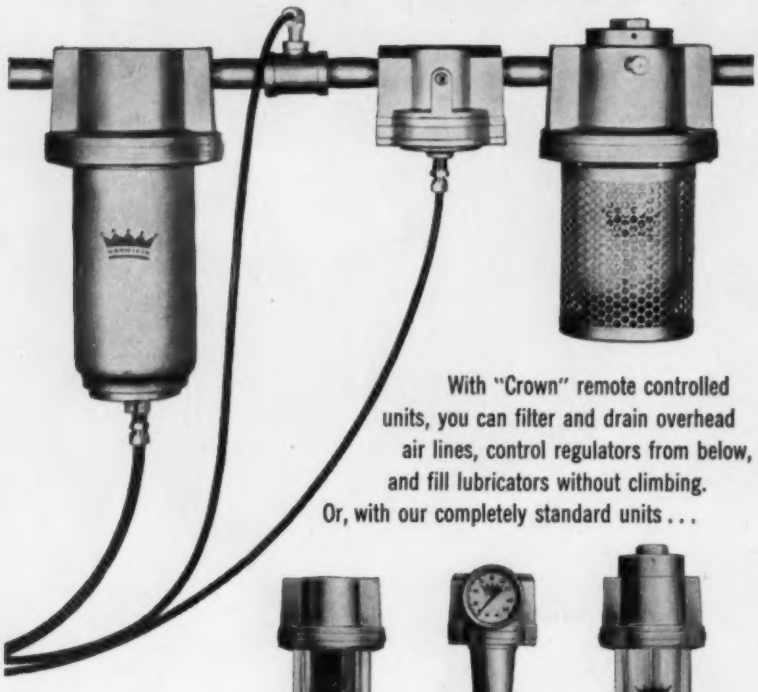
GARDNER-DENVER Since 1859

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

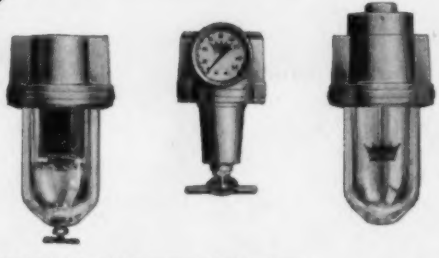
GARDNER-DENVER

HANNIFIN *Crown*

delivers air the way you want it!

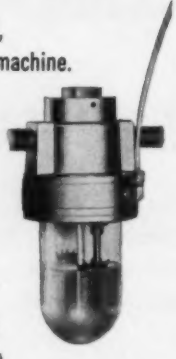


With "Crown" remote controlled units, you can filter and drain overhead air lines, control regulators from below, and fill lubricators without climbing.
Or, with our completely standard units . . .



. . . you can provide just the right amount of filtered, regulated and/or lubricated air right at your machine.

NEW! PULSE-LUBE . . . for off-beat air flow



If air flow is uphill or light or so infrequent that air-borne lubrication won't solve your problem, you can deliver oil just where you need it, in the exact amount you need, through a tiny flexible tube with new "Crown" Pulse-Lube . . .

All these "Crown" developments are detailed and described in a new, comprehensive "Crown" catalog (our Bulletin 0400-B1). We'll be happy to send you one.

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can be determined. Next, a value analysis is made to ascertain the cost of the various factors entering into the quality or value of the part. Then a decision can be made on possibilities of simplification and cost reduction.

What a Foundry Can Expect with a Plastic Core Binder by R. J. Handwerk, B. F. Goodrich Chemical Co., Cleveland—Acrylic-based materials now are being used by many foundries casting high-quality missile parts. Acrylic binders are liquids which are used much like a core oil. They differ drastically from the normal oils and resins in curing or hardening. Actually, they are solutions of a strong plastic dissolved in water, and evaporation of the water is all that's required for hardening. The cores can be baked in an oven at normal temperature range or with infrared bulbs or in any other manner to remove the water.

Advantages claimed for acrylic binders include reduced gas, closer casting tolerances, better surface finish, excellent collapsibility and knockout, no obnoxious odors or fumes, unlimited storage life, fast baking, better tolerance to overbaking, and good hot strength.

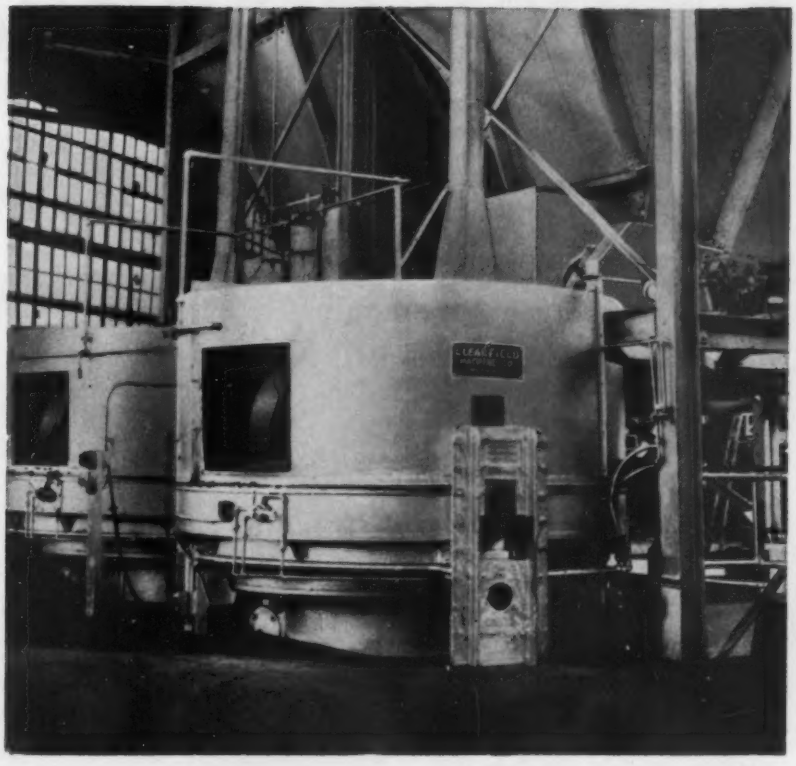
What's New in Light Metals, by C. R. Howle, Aluminum Co. of America, Pittsburgh—New aluminum alloys providing improved mechanical properties and end-use characteristics include A140 and X250 for sand, C355 and A356 for sand and permanent mold, and 364 and X392 for diecasting. Research has advanced knowledge of gating, risering, solidification and gas in metals. Improved melting equipment and practices have resulted in higher quality metal at reduced cost. The vacuum density test permits evaluation of gas in molten metal.

Increased use of commercial fluxes and grain refiners has improved casting quality. Special casting techniques employed with the new high-purity alloys have resulted in development of premium quality castings for aircraft, missile, and other applications requiring high strength. The low-pressure permanent mold process and use of vacuum techniques in diecasting offer interesting possibilities.

Malleable sessions considered core sand practice, induction melting,

the CLEARFIELD MIXER

mixes, tempers, aerates



the Clearfield Mixer

is engineered, designed and built to prepare sand properly

Properly prepared sand for best foundry results doesn't just happen. It's the natural result of using correct equipment and a matter of precision in controlling all factors involved. Clearfield Mixers always give you properly prepared sand, and there is a Clearfield Mixer for every requirement. Write today for Catalog No. 90. Get complete details on the tested efficiency of Clearfield Mixers.

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

For More Information Circle 632, Page 39

and a motion picture film on a mechanized foundry. **Core Sand Practice for the Malleable Iron Foundry,** by Donald Dalton, Thiem Products Inc., Milwaukee—Through control of variables in oil-sand mixtures, a foundry can gain many benefits. Grain size can be adjusted by blending two or more sands. Dry sand should be used in formulating the mixture, and the formulation should be on a weight basis. Cereal and clay provide green strength, and the oil provides hot and dry strength. Wood flour is employed to reduce sand expansion.

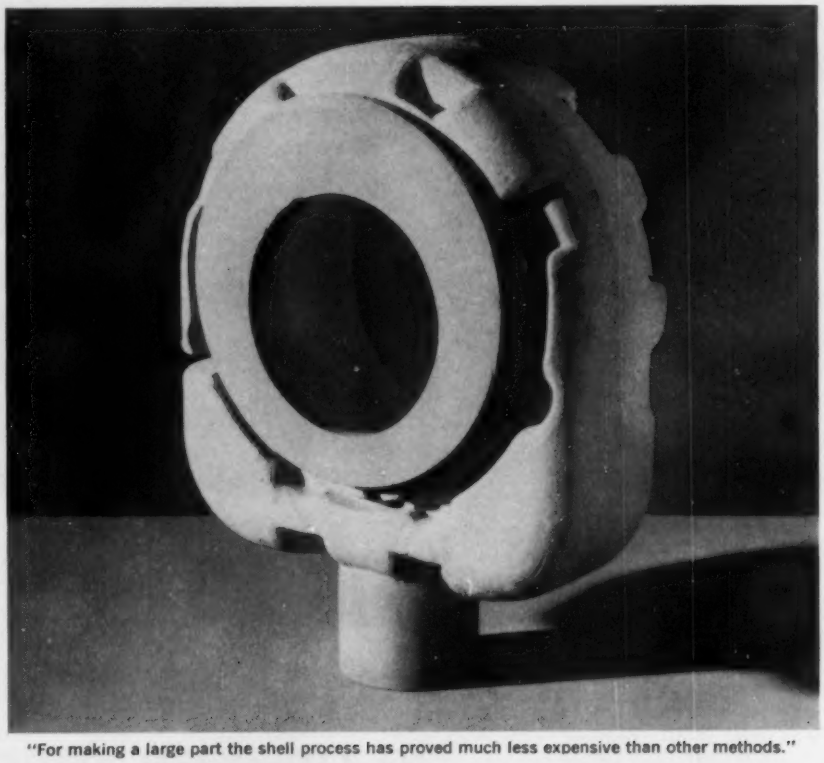
Foundry Flexibility was depicted in a motion picture film shown by Carl Schopp, Link-Belt Co., Indianapolis, Ind. Film was taken in the speaker's foundry, where castings are produced by both the green sand and shell molding processes and cores are made from oil-sand and resin-sand mixtures. The latter are used in heated boxes.

Induction Melting of Malleable Iron, by Charles F. Smith, I-F Mfg. Co., New Philadelphia, Ohio—The operation described uses three 5000-lb capacity, line-frequency induction furnaces which melt 24 hours a day, six days a week. They are held under low power over the week-end. The furnaces melt at the rate of 1200 lb an hour on a cycle which includes removal of 400 lb molten metal every 20 minutes and immediately recharging with the same amount of cold material. Metal temperature averages about 2900° F.

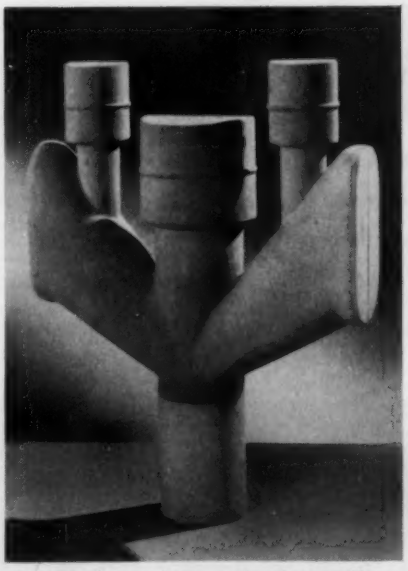
Patternmakers discussed developments in plastic and plaster, heated corebox equipment, and cast-to-size patterns. **New Developments in Plastic and Plaster,** by Stan Munson, Ren Plastics Inc., Lansing, Mich.—Several epoxy plastic materials used in planking, paste and liquid form are suitable for patterns and coreboxes, models, and tooling. These dimensionally stable, thermosetting resins are used as laminating or casting materials. The materials are light in weight, need no special storage or refrigeration, set at room temperature, bond to almost any material, and have good ductility. They lend themselves well to the modification or repair of patterns and tools.

Heated Corebox Equipment—What It Means to the Pattern Shop,

HOW A FOUNDRY SHELL CORES...



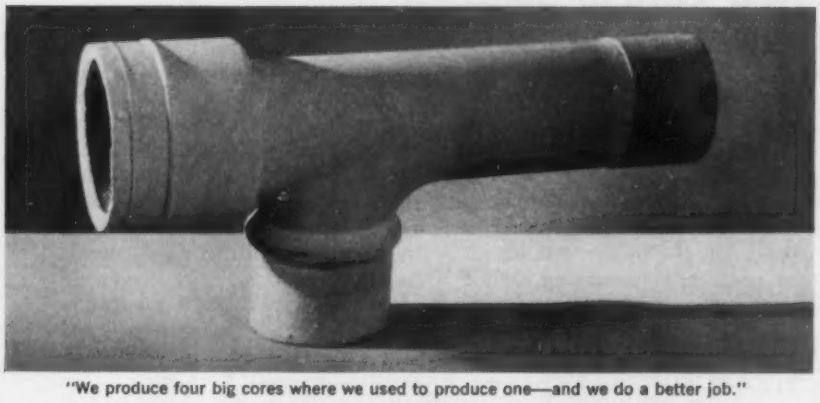
"For making a large part the shell process has proved much less expensive than other methods."



"No handling problems, no knockout problems. And we can stack shell cores."

"We use Durez foundry resins 100%. They give us consistency from one order to the next."

FEELS ABOUT AFTER 6 YEARS



"We produce four big cores where we used to produce one—and we do a better job."

MORE CASTINGS BETTER CASTINGS LOWER PRODUCTION COSTS

"On some cores we save as much as 50%."

That's the experience of this long-time user of shell cores bonded with Durez foundry resins.

Men of Hallstead Foundry, Hallstead, Pa., were among the first to start working with shell cores. The foundry produces castings for plumbing and heating equipment, automotive parts, textile components, appliance gears and wheels.

Modern core equipment releases skilled labor for other work. The process makes core rooms and core ovens unnecessary, saving 75% of the space once needed. Hallstead's core operation can work around the clock. That means better use of employees' time.

With Durez resins, this foundry gets coated sand that can be conveyed by air from the muller with no loss in tensile strength. Cores are uniformly strong with low resin content.

You can get results like these, too. Your Durez sales engineer works with foundrymen in your area—shows them how to get *all* the production economies of modern shell molds and cores. Call him in soon. Or write for Durez 32-page "Guide to Shell Molding" and 16-page "Guide to Resin-coated Sand," which contain valuable recommendations on patterns, materials, mixing, temperatures, lubricants, molds, cores.

DUREZ PLASTICS DIVISION

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HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

For More Information Circle 633, Page 39

by H. R. Bilter, International Harvester Co., Milwaukee—This slide presentation showed specially designed shell coremaking machines featuring built-in heating devices for curing cores made with furan or other type resin binders.

Improved Methods for Cast-To-Size Patterns—Shaw Process, by R. J. Christensen, Wisconsin Pattern Works Inc., Racine, Wis.—Contrary to general belief, precision castings usually require some machining. The Shaw process has a particular advantage for precision pattern castings that must be machined. The insulating characteristics of ceramic molds minimize case hardness on iron castings so that skin cuts can be taken.

Present tolerance ranges in precision castings are ±0.005 on 0 to 3.0 in., ±0.015 on 3 to 8 in., ±0.030 on 8 to 15 in., and ±0.045 on larger work. In most instances, the tolerances can be halved because patterns and coreboxes are laid out from centers.

Patternmakers have failed to recognize the impact that permanent molding, diecasting, compression molding, and other methods can have on the patternmakers' market. They have failed to the extent that the tools for such casting methods are being made in shops other than pattern shops. The natural abilities of the patternmaker suit him ideally, however, for providing these tools.

Armed Forces College Offers Courses to Qualified Civilians

The Industrial College of the Armed Forces extends an invitation to qualified civilians in business, industry, and the professions to enroll in its graduate-level correspondence course, "The Economics of National Security."

This course presents the subject matter of the resident curriculum adapted to the correspondence method of study and consists of 22 bound volumes organized into five integrated units of study. All tests and instructional materials are furnished at no cost to students.

Interested persons may apply to the Commandant, Industrial College of the Armed Forces, Washington 25, D. C., Attention: Correspondence Course Div.

Foundrymen See Improved Casting Sales

PHILADELPHIA — Foundry business is edging upward, stimulated to some degree by seasonal influences, notably in the construction field.

Some gray iron jobbers estimate a gain in March of more than 15 per cent, and although this admittedly was due largely to the greater number of working days compared with February, the daily average was a shade better. Improvement in other categories also was noted.

Gray iron shops are averaging around 65 per cent, with most operating three to four days a week. Shipping promises range generally at one to two weeks. In addition to construction needs, there is moderate improvement in auto die work as auto manufacturers anticipate a greater swing toward demand for smaller cars.

Printing machinery requirements are slightly better, as also are material handling needs. Pump and power transmission work is only fair, however, and one leading foundryman estimates tobacco packaging and processing machinery needs are off 10 to 15 per cent from a year ago. Machine tool specifications are slow.

Steel casting jobbers report improvement in alloy work. There are more specifications from manufacturers of food processing equipment and the chemical industry; missile requirements also are more active. Steel foundries are operating at 60-65 per cent, and deliveries average four weeks.

Malleable foundries note a pick-up in building hardware and some improvement in demand from the coal and oil industries, particularly for repairs and maintenance. Transmission tower requirements are running a little heavier. Pleasure craft components are moving at a seasonal high. Pipe fittings demand is spotty. Imports reportedly are cutting into the fittings business, and there is a definite falling off in exports, especially to Central and South America.

Buying of nonferrous castings is on a hand-to-mouth basis. The red metal job shops are doing scarcely better than 50 per cent of normal, but the light metal foundries appear to be averaging around 75 per cent.

Optimism Growing in Pittsburgh

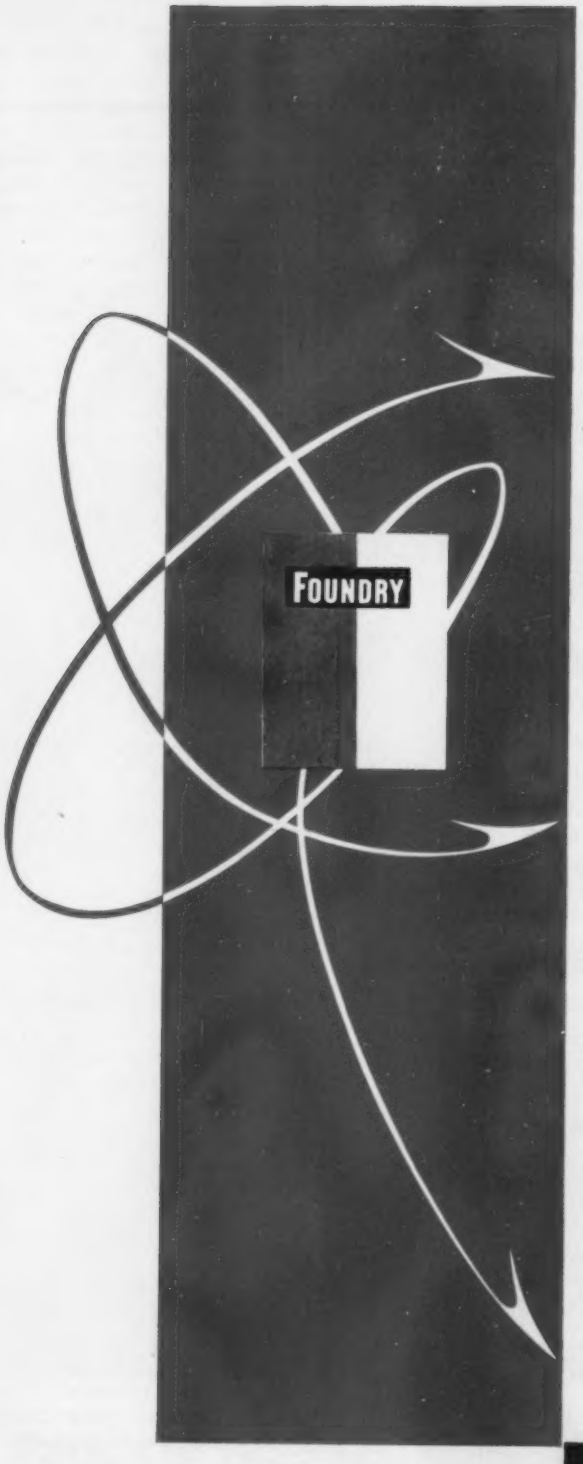
PITTSBURGH — Foundrymen here are still having their ups and downs, but they're more optimistic than they've been in months. At some gray iron shops, business definitely is trending upward. At others, there's quiet confidence that the recession has bottomed out, even though bookings show no improvement. The recent upturn in steelmaking is partly responsible, of course, since local mills are big buyers of rolls and castings.

The most cheerful report by far comes from a big gray iron producer with diversified markets. "This looks like the turnaround we've been waiting for," a spokesman told FOUNDRY. "There's a fair chance that we'll be running at capacity before the month is out. We've been melting four and five days a week, and when you start bouncing around like that you know you're on the way up. Last summer and fall, we were lucky if we could melt three days a week."

Less enthusiastic, a smaller firm complained of "disappointing" sales in early March. "I guess we should have expected some letdown," its sales chief said. "February was the best month we've had in about four years, thanks to some big orders from industrial furnace manufacturers. Now they're tapering off, and nothing else is taking up the slack."

Still another gray iron producer predicts a downtrend in its second

HIGHEST AWARD: William S. Pellini, superintendent, U. S. Naval Research Laboratory's Metallurgy Division, receives the Navy Distinguished Civilian Service Award from Assistant Secretary of the Navy (Research and Development) James H. Wakelin. The Navy's highest civilian award was presented "for outstanding research in the field of metallurgy, and particularly for the ingenious development of procedures for the selection and specification of materials for ship and submarine hull structures." Watching the ceremony are Mr. Pellini's wife Katheryn; his mother Mrs. Mary Pellini, and children Carolyn, Carl, and Linda



SPECIAL EDITORIAL REPORT

Meeting Competition Through Improved Foundry Technology

To capture a growing share of the market for engineering materials, foundrymen must take advantage of the latest developments in casting practice.

Next month, to spotlight these developments, the editors of FOUNDRY will present a special report to the metalcasting industries. This report will detail recent technical and operating advances in the production of the various cast metals. It will appear in the May, 1961

Pre-Convention Issue

It will be published just before the 65th Castings Congress of the American Foundrymen's Society in San Francisco, May 8-12. These metals will be covered:

- **Gray Iron Castings**—by Charles F. Walton, Technical Director, Gray Iron Founders' Society
- **Steel Castings**—by Charles W. Briggs, Technical and Research Director, Steel Founders' Society of America
- **Malleable Iron Castings**—by Hans J. Heine, Technical Director, Malleable Founders Society
- **Aluminum Castings**—by Floyd A. Lewis, the Aluminum Association
- **Brass and Bronze Castings**—by Richard A. Flinn, University of Michigan, Technical Consultant, Non-Ferrous Founders' Society
- **Magnesium Castings**—by Robert C. Boehm, Director of Quality Control, Wellman Bronze & Aluminum Co., Cleveland
- **Zinc Castings**—by Dr. Schrade F. Radtke, Director of Research, American Zinc Institute

In addition to these discussions, which will constitute an important contribution to foundry knowhow, the May Pre-Convention issue will present program details on the Convention and will include all the regular editorial departments.

a Penton *publication*

FOUNDRY

The Business Magazine of Metal Casting
PENTON BUILDING • CLEVELAND 13, OHIO

quarter sales for an unusual reason: It's finishing up a five-month program of auto die work that kept its operations on a five-day, two-shift basis through the winter. "We'll have to reduce our work force in a couple weeks unless something else comes along," a sales executive declares.

Rolling mill roll producers complain that their sales were very poor in January and February — only about half of last year's average monthly volume. Mill inventories are very low, however, and it's considered likely that any pickup in steel production quickly will be translated into new orders for rolls. Early March bookings were up a little, causing salesmen to predict that "Things will start breaking in about a month."

New England Looks to Upturn

BOSTON — Foundrymen are more confident that the lag in volume bottomed out in the first quarter. With few execptions, casting orders and melt have not increased, but most shops are more optimistic for the next three months. Pressure for delivery accompanies most orders.

Shops producing for construction, including highway castings, are showing seasonal improvement, although few expect a record year. Malleable shops operate four and in some instances five days per week, but without full crews, and forward buying is hesitant. The same is true for gray iron.

Monthly consumption of ferrous metal in New England for the first quarter averaged approximately 35,000 tons of scrap and 11,500 tons of pig iron. Two small integrated steel works are included in this compilation. For some months, a higher ratio of scrap to pig iron has been a growing trend—and more so in New England than in most other areas.

Hunt-Spiller Mfg. Co., South Boston, is revising its production program, discontinuing industrial jobs and concentrating on Diesel work. Hunt-Spiller always has been a leading factor in railroad work. It cast parts for some of the earlier steam locomotives.

Brass and bronze and aluminum foundries are operating on a hand-to-mouth schedule but are looking for a slight improvement in April.

Midwest Outlook Still Uncertain

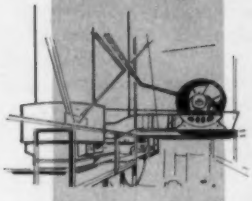
CHICAGO—Gray iron foundries in this area are finding the expected upturn in business elusive, but the second quarter still is promising. Of 13 representative job shops, one is operating only 24 hours a week, six are at 32 hours, one is between 32 and 40 hours, one is at 37 hours and four are doing 40 hours.

One foundry reports its backlog at one week, six have two weeks, one has between two and three weeks, four have three weeks, and only one has sufficient orders to run four weeks. Operating rates range from 50 to 85 per cent of capacity for an average of 64 per cent for the group.

For the next three months, business outlook is characterized as "fair," "uncertain," or "questionable" by the majority. Only one reports "good," and three are "optimistic."

In the three-state area of Illinois,

SPENCER
famous in foundries



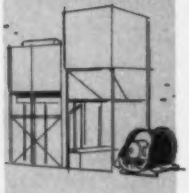
Familiar to foundrymen . . . and held in high regard . . . are these well known Spencer products:

CUPOLA BLOWERS

By far the first choice of cupola manufacturers . . . and for replacement. Rugged, reliable units in a full range of capacities from ⅓ to 1,000 H.P.; up to 20,000 C.F.M.; 4 oz. to 10 lbs. pressure.

VACUUM CLEANERS

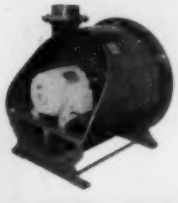
Heavy duty units built to handle the tough cleaning assignments. Sizes from 1½ through 15 H.P.



BLOWERS ON SAND RECLAIMERS

Performance proven units that are first choice of leading reclaiming equipment makers.

Request descriptive literature or the name of the Spencer representative in your area.

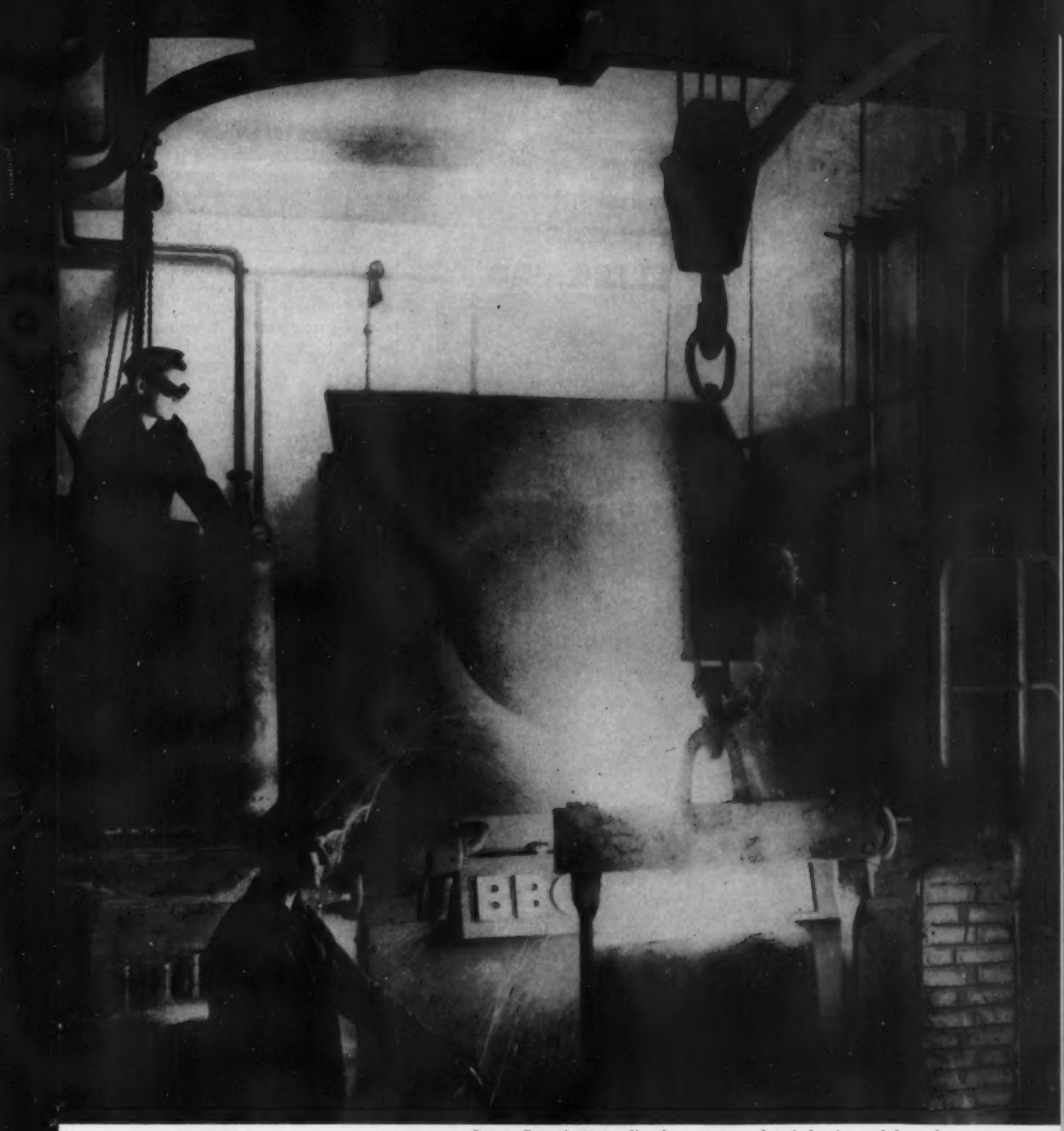


Catalog No. 126C describes Spencer blowers; Catalog No. 155B provides information on Spencer industrial vacuum cleaners.

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For More Information Circle 634, Page 39

Circle 635 on Page 39→



Brown Boveri 5½-ton line-frequency coreless induction meltdown furnace

PREVIEW: FOUNDRY OF THE FUTURE

Early in 1962, in a German plant, *a single operator* at a central console will supervise the "punchcard" operation of an entire gray-iron foundry . . . including charging and meltdown in nine 5½-ton induction furnaces; the automatic alloying, analysis and correction of the melt; and the automated casting strip. The furnaces and automation equipment are now being engineered and built by Brown Boveri.

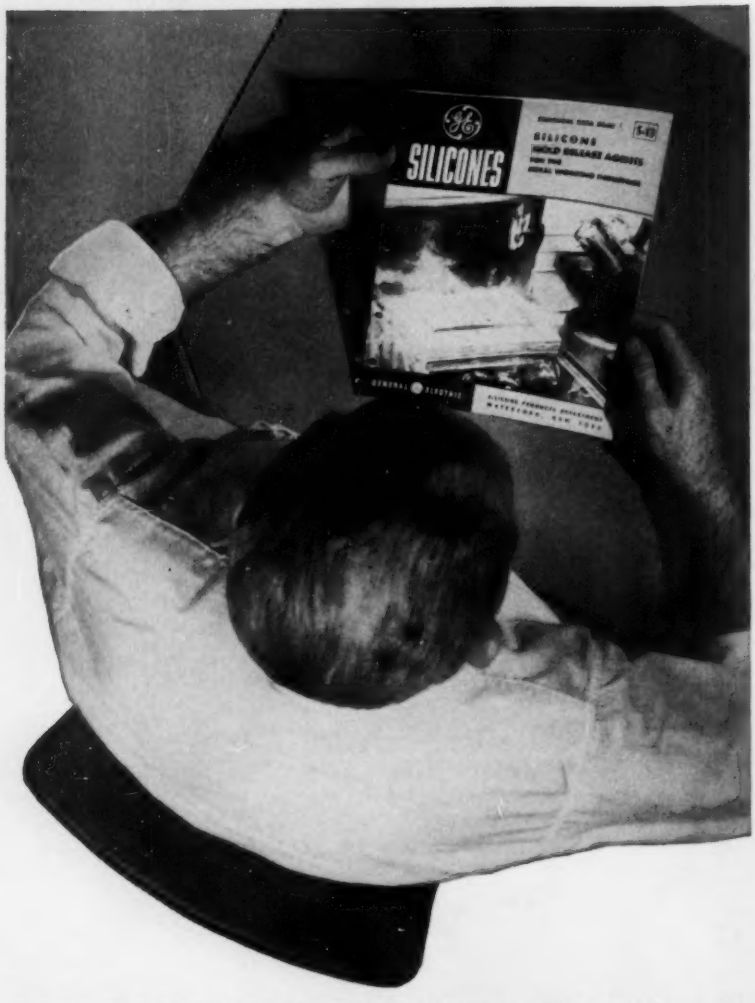
The furnaces will be Brown Boveri line-frequency coreless induction units similar to that in the photo. Here is why this furnace is rewriting foundry technology:

It produces superior, more uniform metal. It is clean and cool to operate. It is simple, rugged and foolproof, thus ideally suited to automatic control. It is low in cost. (For example: the nine-furnace set-up *including all controls* will cost substantially less than cupola-and-induction furnace duplex equipment.) Sizes up to 18,750 lbs. per hour. And the furnace design has been proved by *hundreds* of installations in the U. S. and throughout the world . . . with a total capacity greater than that of any other manufacturer.

Furnaces for melting, holding, superheating . . . for any metal. Write for application study: Brown Boveri Corp., Dept. 4, 19 Rector St., N. Y. 6.

BROWN BOVERI

FIND OUT WHY
STEVENS
SILICONE RELEASE
AGENTS DO A BETTER JOB



FREE, FACT-FILLED TECHNICAL DATA BOOK, offered by Frederic B. Stevens, Inc., gives you complete information on new, improved Stevens G.E. Silicone Release Agents for shell core, mold and hot box applications. Find out how you can benefit from these ideal G.E. silicone properties: rapid, even coverage . . . resistance to thermal breakdown . . . chemical inertness . . . maximum economy in application and in pattern cleaning.

Stevens offers a complete line of G.E. silicone fluids, emulsions and solutions to meet all your mold release requirements. Write for this informative Data Book today!

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Indiana and Wisconsin, farm machinery holds the brightest outlook for castings. Inventories of tractors and implements at both factory and dealer level are greatly reduced, and farmers are expected to buy more this year than they did last year.

Automobile production is lagging far behind the normal pattern, and as of mid-March prospects for a big upturn in sales were lacking. Car builders were much encouraged, however, by record-breaking attendance at the Chicago Automobile Show in late February. The 789,734 visitors were 52 per cent more than the previous all-time high of 518,521 in 1958. Chicago area car dealers immediately experienced an increase in their showroom traffic and a marked pickup in sales of new and used cars which they interpreted as start of the spring upturn in demand. Automobile production usually is the pace-setter for the economy and an early turnaround would stimulate the output of castings.

Also encouraging to castings makers was the February business survey report of the Purchasing Agents Association of Chicago which said "Continued improvement in order backlogs and production levels coupled with firmness in price and inventories offer room for some optimism."

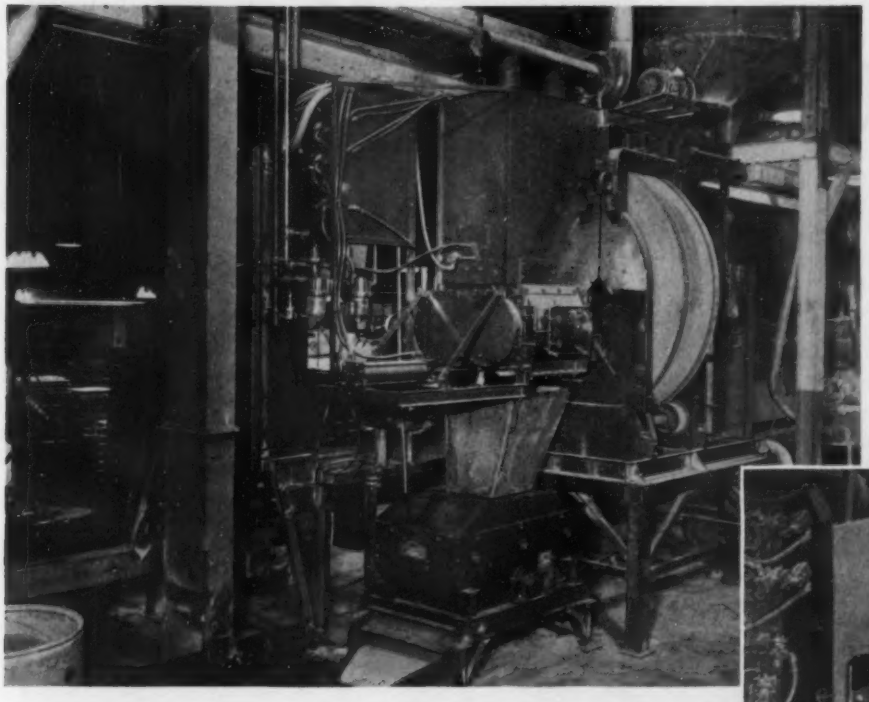
Of concern to foundries at the moment are upcoming wage contract negotiations which got under way last month (March). If union wage demands are met even in part, higher prices for castings would seem inevitable and would be a market deterrent.

"This is a mighty sick pot of metal you have here"

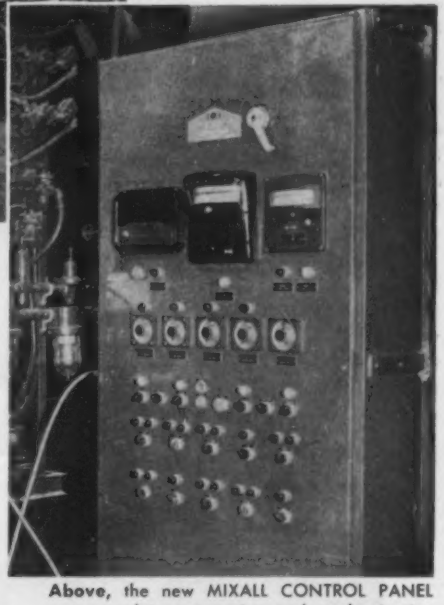
EATON MANUFACTURING CO. REPORTS:

"The MIXALL gives us up to 3,000 lbs. of Resin-Coated Sand per hour — yet adds Nothing to our manpower costs."

—HOWARD U. McCLELLAND, *Chief Engineer, Foundry Division*



Larger Models Available up to 20,000 lbs. per hour with 2,000 lb. Batch Capacity.



Above, the new MIXALL CONTROL PANEL puts complete automation and mechanization at your fingertips. Controls are conveniently located, easy to read and understand.

Using existing manpower to achieve greater efficiency is the key to competitive foundry operation. That's one big reason Eaton Manufacturing Company's Foundry Division has turned to MIXALL sand coating machines. They can be operated by anyone. No costly "experts" are needed. A quick adjustment of the automatic controls coats all available sands, wet or dry, with all commercial resins, liquid or powder. The result: Just the right resin-coated sand to meet *exact* specifications. Other MIXALL advantages include less maintenance than any other machine, uniform pugmill mixing, independently controlled, simultaneous heating and mixing cycles, and instant temperature reading.

You, too, can meet today's increased competition with MIXALL. Your nearby C&S representative will be happy to show you how. Why not contact him soon?

Write today for Bulletin CS-806

C&S PRODUCTS CO., Inc. *"Constant Quality through Constant Control"*

Affiliated with Barber-Greene

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SAND (WET or DRY) + HEAT + RESIN (LIQUID or LUMP) "HEXA" → COATED SAND (FREE FLOWING — LUMP FREE)

For More Information Circle 637, Page 39

Foundrymen Learn About

MARKETING APPLICATIONS

Thomas M. Ware, right, president, International Minerals & Chemical Corp., looks over a demonstration model of a casting. With him are Norman Dunbeck, IMC vice president, left, and Walter Gerlinger, president, Walter Gerlinger Inc. IMC and Gerlinger co-sponsored the foundry marketing conference

● MARKETING and its profitable application to the foundry industry was the theme of an informative conference held in Milwaukee, Jan. 17. Sponsored by Walter Gerlinger Inc., Milwaukee, and International Minerals & Chemical Corp., Skokie, Ill., the meeting was attended by about 125 representatives of 46 foundries.

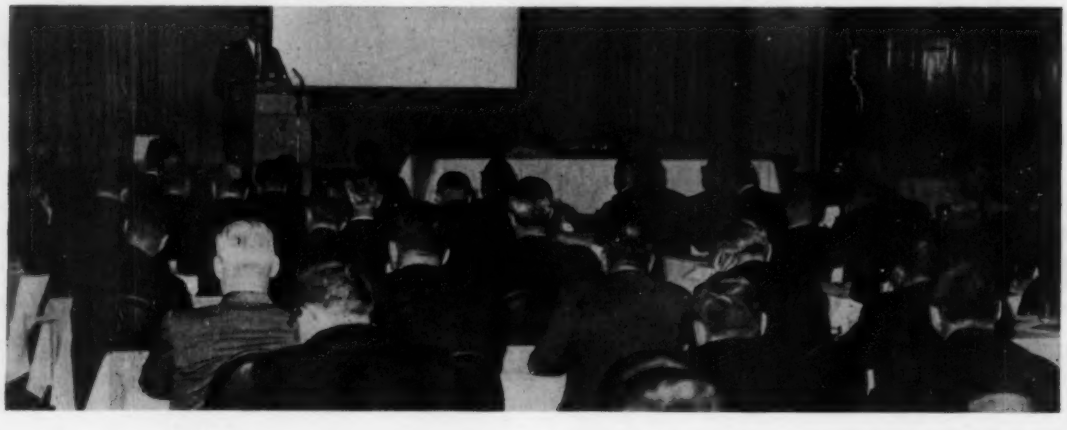
The program was intended to air such subjects as the basic interdependence of sales and production, the proper relationship between buyer and seller, background requirements of the foundry salesman, and method of foundries in combating price competition.

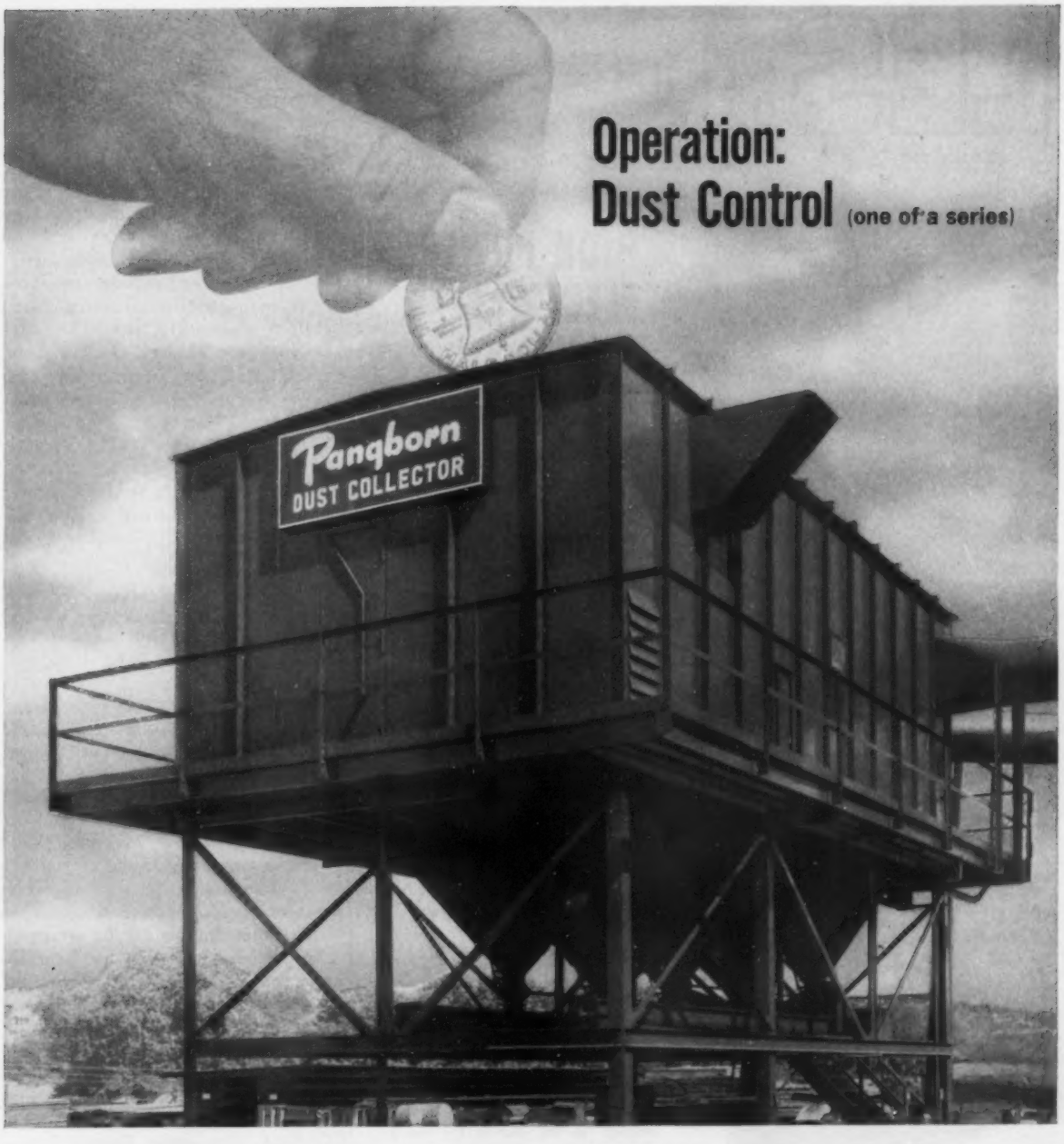
Walter Gerlinger and Norman J. Dunbeck, vice president of International, introduced the program, which included seven papers. At the conclusion of the morning and afternoon presentations, the speakers served as a panel to answer questions from the audience.

Titles of the talks and the speakers included the following: "The Customer's Viewpoint," by Andrew J. Paul, assistant purchasing agent, Caterpillar Tractor Co., Peoria, Ill.

"How Production and Sales Engineering Can Work Together," by Ross L. Gilmore, president, Superior Steel & Malleable Castings Co.,

Above—Norman Dunbeck relays questions from the audience to the speakers panel. *Below*—Part of the crowd of 125 which turned out for the conference





EVER SEE A BANK LIKE THIS?

Salvaged dust can mean money in the bank. And Pangborn Dust Control equipment works quickly and efficiently to reclaim valuable dust for you.

Yet salvage opportunities are only a part of the savings offered you by Pangborn Dust Control equipment. It also eliminates health hazards in your plant and makes for better housekeeping; it removes abrasive or corrosive dusts that can endanger machinery; and it increases the efficiency of your employees and improves community relations.

Pangborn has the right Dust Control equipment for all your needs: Dry Collectors in Cloth Bag, Tube, Screen, Self-Cleaning, Unit Types and Wet Collectors in all sizes. For all the facts write:

Pangborn Corporation, 1400 Pangborn Blvd., Hagerstown, Md.; Pangborn Canada Ltd., 41 Mattson Rd., Toronto, Ontario, Canada;—Manufacturers of Dust Control, Blast Cleaning and Vibratory Finishing Equipment ...ROTOBLAST® Steel Shot and Grit®

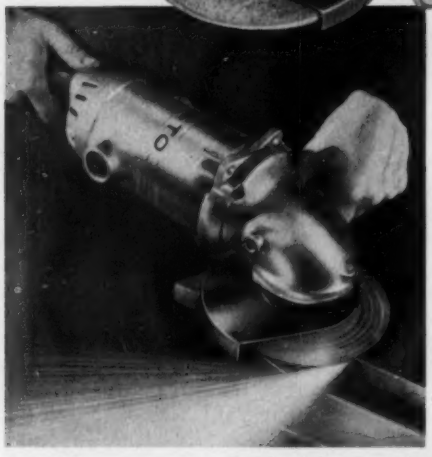
Pangborn
OF HAGERSTOWN

For More Information Circle 638, Page 39

LESTO

GES 95 A

HIGH POWERED ELECTRIC ANGLE GRINDER 1.6 hp.



Swiss precision-made, the LESTO GES 95A is the **strongest** angle grinder on the market. Peak performance—sanding, grinding, cutting—even under the toughest conditions.

For complete information, see your dealer or write:

VICTOR J. KRIEG, INC.
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MAMARONECK, N. Y.

For More Information Circle 639, Page 39

PORTABLE TENSILE TESTER

That Tests Wherever You Take It!

CAPACITIES FROM 2000 TO 40,000 LBS.

Pull tensile tests wherever you may be—in the shop or in the field, in the lab or on the line. Tests flat or round specimens, cast coupons or weld samples. Two simple, compact sizes. Light enough to be carried by two men; rugged enough to stand up under constant moving. Can be mounted on wall or bench according to space limitations.

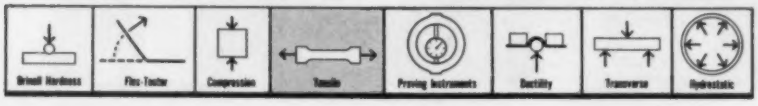
Easily adjustable for specimens up to 2" wide, 12" long. Interchangeable wedge-type jaws readily inserted and adjusted. Load applied hydraulically by manual pump. Capacities up to 40,000 lbs. Cylinder stroke is 2½". Gage is 8½" OD, has maximum indicating hand.

Distributors in most major metalworking areas

Write or call Steel City if you have any testing problem

Steel City Testing Machines Inc

8801 Lyndon Ave., Detroit 38, Mich.



Benton Harbor, Mich.

"Requirements of a Good Salesman," by Russell C. Johnston, sales manager, Industrial Div., Crown Iron Works Co., Minneapolis.

"How Teamwork Develops New Business," by Donald B. Fulton, vice president and general manager, Northern Malleable Iron Co., St. Paul.

"Sales Oriented Foundrymen," by Tom Barlow, foundry products sales manager, International Minerals & Chemical Corp.

"Applying Modern Quality Control Methods to the Foundry," by Harry S. Kindle Jr., manager, quality control, Cummins Engine Co., Columbus, Ind.

"Building a Marketing Approach," by Anthony E. Cascino, vice president, marketing, International Minerals & Chemical Corp.

Penn State Conference Will Be Held June 22-24

Pennsylvania State University will hold its third biennial Penn State Foundry Conference on June 22-24. Objective of the conference will be to provide up-to-date discussions for the operating foundryman. Experts will present practical papers relating to gray iron, malleable iron, steel, nonferrous alloys, and sand, and discussion leaders will provide additional information.

Accommodations can be arranged through the university or handled separately. All registrations for the conference must be made in advance. Charge for the conference is $15 and includes registration fee, instructional materials, and one luncheon, picnic, and banquet. For additional information, contact Bryce C. Gray, Conference Center, Pennsylvania State University, University Park, Pa.

Book Review

Production Control, **by Nyles V. Reinfeld, published by Prentice-Hall Inc., Englewood Cliffs, N. J. Price $8.**

Book discusses principles and functions of production control, financial planning and control, techniques of forecasting, improving paperwork procedures, managing and controlling inventories, and using tools for scheduling.

For More Information Circle 640, Page 39

She got the job done, but...

Remember the die-hard dare-devil type? The hot pilots who operated "dope and bailing wire" airplanes long after aviation went on to better equipment? Today the same kind of challenge may tempt some *foundry* operators to cling to outmoded production methods.

Logan Plant Dynamation engineering offers a more creative (and profitable) challenge: to prove how well the foundry can produce. Managers sit down with "The Man From Logan" and analyze the basic dynamics of a plant. From that point he has the techniques, foundry experience, and complete equipment line to develop the *one right* conveyor system—the system that will help pace the foundry to its true capacity.

This full *dynamation* of the plant pays for itself fast and helps you operate at maximum efficiency for years to come.

Phone or write for a visit from the Logan Plant Dynamation specialist near you. If you are building or remodeling, the earlier you call him in, the more help he can offer.

Logan Plant Dynamation design helps you harness all the work-power of your plant

Logan Conveyors

LOGAN CO., 581 CABEL ST., LOUISVILLE, KY.

SEND FOR CATALOG F

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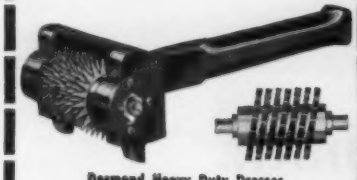
Desmond Hex Dresser

LIVES FOR FOUNDRY GRINDING WHEEL



Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide six sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

For More Information Circle 642, Page 39

A foldout stage puts sand conditioning equipment on view to foundrymen

MOBILE FOUNDRY UNIT

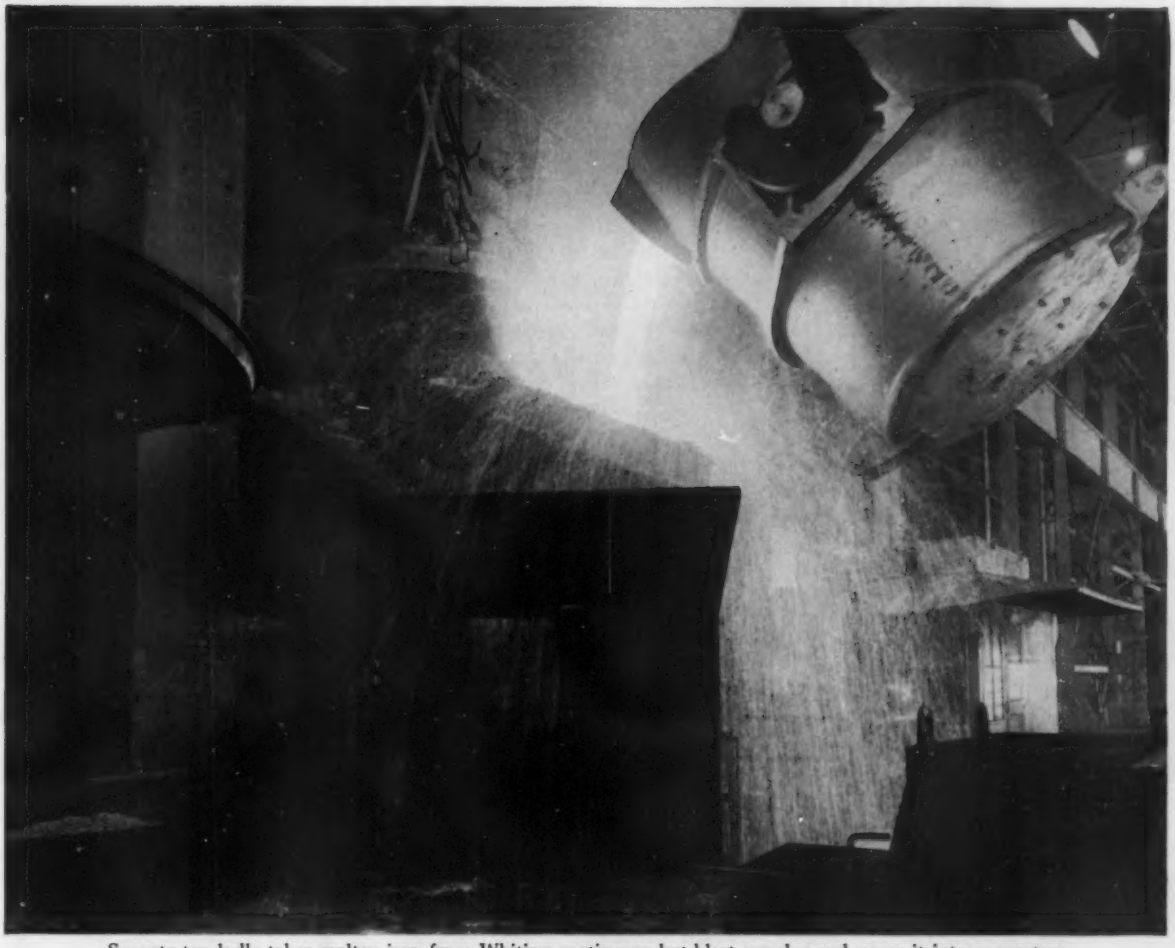
Completes 12-State Tour

● IN THE nearly 11 months since the 1960 AFS Castings Congress & Exposition in Philadelphia, the Simpson Foundry Caravan—a mobile sand conditioning demonstration plant operated by National Engineering Co., Chicago—has made a remarkable record.

The 38-ft trailer crammed with 10 tons of sand conditioning, reclaiming, air conveying, and dust collection equipment has visited 78 foundries in 12 eastern and southern states; processed over 250,000 lb of sand, 1500 lb at a time; been viewed by more than 1000 foundrymen; and worn out several crews of demonstrators.

The unit has traveled in excess of 20,000 miles, the longest haul between foundries being 240 miles and the shortest 20 miles. Now being readied for a spring tour of West Coast foundries, the Caravan is scheduled to make stops in the western states during the summer and in the midwest during the fall and early winter.

Demonstration equipment, left to right, includes continuous air conveyor, batch air conveyor, cooling elevator, and continuous sand muller



Seventy-ton ladle takes molten iron from Whiting continuous hot blast cupolas and pours it into converters.

It's Foxboro control for giant new Acme steel plant

Hot Blast Cupolas have capacity of 50 tons per hr. – operate continuously

Cupolas 67 ft. high by 10 ft. in diameter – the world's largest – are under Foxboro control at Acme Steel's new 35 million dollar plant at Riverdale, Illinois.

To keep hot blast cupolas operating at peak efficiency, Acme depends on Foxboro instrumentation. Foxboro temperature, pressure and flow recorders and controllers to keep air leaving preheaters at a constant 1200F. And Foxboro Air Weight Controllers, that meter blast air by weight instead of volume, to help cut fuel costs.

Furnaces, cupolas, preheaters — you'll find Foxboro instruments help operate them all more efficiently. Ask your nearby Foxboro Field Engineer for recommendations for your plant. Or write direct for a copy of Bulletin 13-18. The Foxboro Company, 324 Neponset Ave., Foxboro, Massachusetts.

Small-case Foxboro Consotrol* instruments (foreground) record and control preheater pressures, temperatures, flows. Preheaters were designed by Fabricating Engineering Co., Inc. *Reg. U. S. Pat. Off.*

FOXBORO

REG. U. S. PAT. OFF.

For More Information Circle 643, Page 39

PATENTS of INTEREST

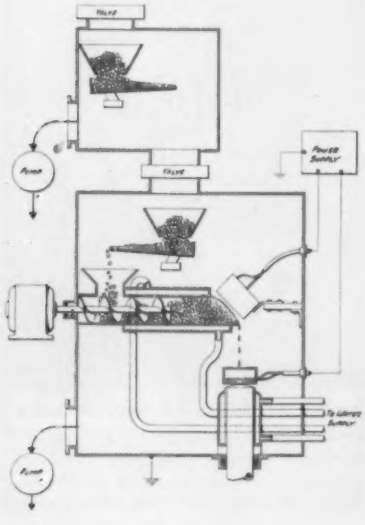
Core Sand Binder

Binding agent for sand cores is comprised of a mixture of polymers of the dimers and the codimers of cyclopentadiene, methylcyclopentadiene, higher alkylated cyclodienes and acyclic dienes with drying oils such as linseed, soya bean, tall, fish, etc.

Polymers are obtained by heat soaking at 220 to 240° F steam-cracked petroleum which boils between 80 and 350°. Undimerized material is separated, and the dimers and codimers are polymerized by catalyzation with boron fluoride or aluminum chloride. Resulting product is mixed with linseed oil and diluents such as toluene, naphth . Varsol, Solvesso 100, etc. *Patent No. 2,963,456 granted to J. L. Betts Jr., and H. K. Wiese and assigned to Esso Research and Engineering Co.*

Vacuum Melting

Apparatus for melting and outgassing materials *in vacuo* consists of a relatively small lock chamber and a large main treatment chamber or tank, each communicating with its own vacuum pump. Lock chamber is provided with a vacuum-tight

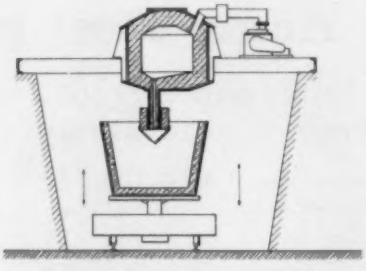


leading valve through which material to be heated is introduced into main treatment chamber. Hopper below the valve feeds material into a vibratory feed mechanism and into another small hopper which opens into a screw conveyor.

Thermionically-emissive cathode structure at the end of the screw conveyor melts the material which falls in the form of drops into a watercooled mold. Another thermionically-emissive cathode above the mold maintans a small pool of liquid at the upper part of the mold. Solidified metal in the mold is withdrawn from below continuously. *Patent No. 2,963,530 granted to C. W. Hanks and H. R. Smith Jr., and assigned to Stauffer Chemical Co.*

Desulfurizing Iron

Sulfur in pig or cast iron melts can be reduced to as low as 0.005 per cent by subjecting them to a vacuum of about 0.0005 mm of mercury, and holding for an hour. The surface of the molten iron while

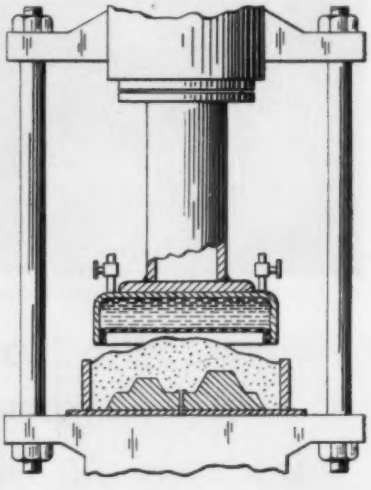


under vacuum is covered with coarse powdered carbon, free from or containing little sulfur such as electrode carbon.

In operation, some of the molten iron in a ladle is drawn up into a refractory-lined chamber as evacuation of the latter is accomplished, the ladle being moved upward as this proceeds. After holding the metal for some time, the ladle is lowered without changing the vacuum of the chamber, allowing most of the metal to flow back into the ladle. Then the cycle is repeated until the desired desulfurization is obtained. *Patent No. 2,967,768 granted to Fritz Harders and assigned to Dortmund-Hoerder Huttenunion AG.*

Molding Machine

Apparatus for making molds and cores from a damp mixture of sand and one or more ingredients which provide a binder for the sand utilizes a pressing member having a liquid-



backed flexible diaphragm. The diaphragm is attached to the bottom of a liquid holding chamber. The chamber in turn is attached to a ram.

In operation the liquid-filled chamber and diaphragm are forced down on the sand contained in a flask surrounding a pattern. The uniform pressure exerted by the liquid and transmitted to the sand by the diaphragm allows the latter to yield in areas which are more resistant to packing than others and causes it to bulge in less resistant areas. *Patent No. 2,962,775 granted to H. L. Rekart and assigned to National Malleable & Steel Castings Co.*

YOU can profit from using Allis-Chalmers lift trucks just as these foundries have

MIDWEST — Material is handled more efficiently . . . less time is required with this Allis-Chalmers 6,000-lb lift truck. With rotating device, it handles foundry sand, other bulk materials.

Handling of materials offers some of the best opportunities open to foundries for cutting costs . . . since up to 150 tons must be moved to produce one ton of castings. Foundries everywhere have learned that an Allis-Chalmers lift truck is a *proved* way to cut costs on many handling operations.

See your Allis-Chalmers dealer soon. Have him give you the facts on lift trucks with capacities ranging from 2,000 to 10,000 lb — better still, ask him for a demonstration in your foundry.

WEST — Bundles of scrap are handled in the yard, moved to charging area with this 6,000-lb lift truck. The operator "spots" loads quickly because the truck maneuvers so easily in tight quarters.

EASTERN — On indoor or outdoor handling, this 4,000-lb lift truck works fast, drives easily, turns in 72-in. radius to move castings easily.

GREAT LAKES — Inventory was simplified — storage space better utilized because of tons-at-a-time tiering with this 6,000-lb lift truck. It also makes possible real savings on other handling.

NORTH — Over 6,000 hours of trouble-free operation with these Allis-Chalmers 4,000-lb lift trucks caused this foundry to add several more of the same trucks to their fleet.

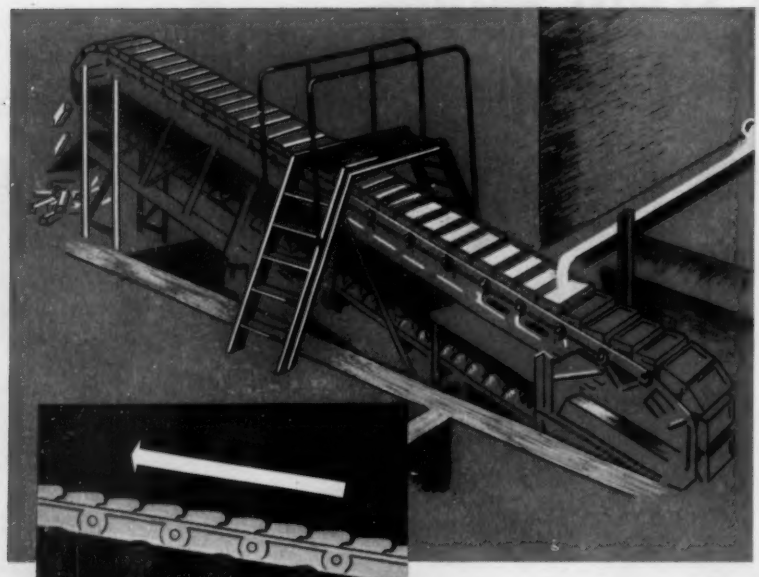
CENTRAL — Handling time was reduced 30% on materials moved by this and another Allis-Chalmers lift truck. They saved 90% of the time formerly required to unload refractory brick.

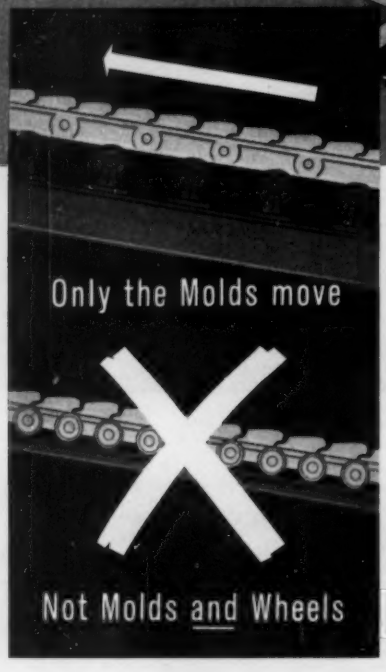
ALLIS-CHALMERS, Milwaukee 1, Wisconsin

BH-61A

ALLIS-CHALMERS

For More Information Circle 644, Page 39





Let
STATIONARY
WHEELS
Reduce your
Pig Casting
Costs

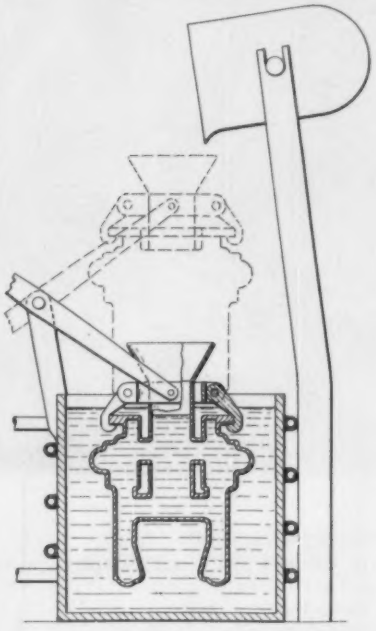
Eliminating 80% of the parts of conventional pig casting machines, this simplified design results in sharp reductions of lost production time and maintenance costs. Since the idler wheels are mounted on anti-friction bearings on the stationary part of the frame, not on the molds, they are positioned as far as possible from hot metal.

Capacities for the machine illustrated: from 3 to 50 tons per hour. Sizes: 15 to 125 feet. Other Bailey Pig Machines are made in single and double strand types and in capacities to 250 tons per hour. Both types feature stationary wheel construction.

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY
1221 BANKSVILLE ROAD PITTSBURGH 16, PA.

Investment Casting

Method of protecting the surface of ceramic shell castings from damage from the atmosphere during early stages of cooling, controlling the rate of cooling, and supporting the shell during pouring or cooling is to immerse the mold in a bath of molten metal, molten salt, molten glass, oil, water, etc. Immersion may take place simultaneously with



pouring the metal into the shell or immediately following pouring. For casting metals melting above 2000° F, molten aluminum at 1500° is found effective in providing a fine grain structure. Lead, tin, zinc may be used for nonferrous alloys. *Patent No. 2,968,848 granted to R. T. Carter.*

Metal Bath Stirrer

Magnemotive agitator for molten metal baths is comprised of a magnetic stirring bed containing a plurality of spaced pole pieces with coils linked to provide a progression of unidirectional magnetic flux forces in the pole pieces. Power is developed in an inductor with a rotor and angularly disposed stators. Alternating current from the inductor is rectified to direct current, and supplied successively to each respective coil surrounding a pole piece. *Patent No. 2,964,581 granted to E. A. Hanff and assigned to Swindell-Dressler Corp.*

SYLVANIA ELECTRIC PRODUCTS INC. USES EMISSION SPECTROSCOPY TO ANALYZE REFRACTORY METAL POWDERS

A MISSILE THROAT INSERT MADE FROM POWDERED METAL

LARGE ISOSTATIC PRESS USED FOR FORMING SHAPES

Spectroscopy is an important tool in the production of molybdenum and tungsten metal powders at Towanda, Pennsylvania by the Chemical and Metallurgical Division of Sylvania Electric Products Inc., a subsidiary of General Telephone and Electronics Corporation.

In the modern spectrographic laboratory above, numerous direct-method in-process material checks are made. Finally, critical trace elements in the range of 0.1 to 50 PPM are identified in the refractory metal powders.

Results — obtained quickly and accurately by emission spectroscopy — permit this firm to control the purity of molybdenum and tungsten powder which means more efficient processing to a high-quality end product.

"National" Graphite grade SPK preformed electrodes play an important part in these determinations. Highest purity combined with improved uniformity and reproducibility make grade SPK an outstanding spectrographic electrode.

The superior structure and strength of SPK electrodes have practically eliminated breakage of the thin crater walls of sample-bearing electrodes.

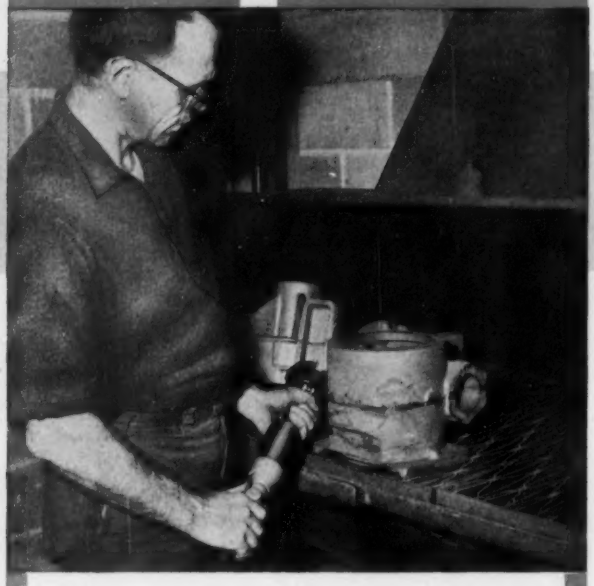
Write today for new spectrographic electrode catalog. Address: National Carbon Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Union Carbide Canada Limited, Toronto.

"National" and "Union Carbide" are registered trade-marks for products of

NATIONAL CARBON COMPANY

UNION CARBIDE

12 NEW GRINDERS in a power range all their own!



Now! You can choose the abrasive tools that best fit your needs from 138 sizes and types of Ingersoll-Rand Grinders.

features

- **Sensitive Weight-Type Governor**—prevents overspeeding, assures positive, accurate speed control.
- **Improved Muffling**—15 decibels quieter than comparable tools.
- **Built-In Lubricator**—automatic motor lubrication increases tool life.
- **Built-In Air Strainer**—protects motor.
- **Rubber-Faced Throttle Valve**—unaffected by moisture, dirt and rust.

New Series 15 Grinders

- **Speed—6000, 9000, 12000 and 15000 rpm**
- **Weight—6½ lbs.**
- **Length—16⅝ ins.**
- **Grip or straight handles with lever or thumb throttles**

Twelve new Ingersoll-Rand grinders in a completely new size and power range! These small, high-performance grinders are specifically designed to fill the need for light weight, easy-handling tools that will hold their speed under load on a wide variety of difficult grinding and buffing jobs.

Series 15 Grinders fill the bill—and offer manufacturers important new proof of tools to increase Annual Dividends on Payroll Dollars.*

*Ask your AIRengineer for a convincing on-the-spot demonstration of how these new grinders—as well as all other Ingersoll-Rand air tools—can earn an Annual Dividend on your Payroll Dollars.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.
Planned Annual Retooling increases output per man

Engineers compare early radiographs and test castings (foreground) when planning additional castings. In this case, they are controlling internal shrinkage by different appendages on the pattern

In the darkroom, final radiographs are checked to assure that flaws of proper type and severity are present

X-ray unit is positioned over a test casting to record defects. Finished radiograph will be 2 x 3¾ in.

Reference Radiographs To Set

NAVY CASTING STANDARDS

● RADIOGRAPHIC STANDARDS for steel castings with section sizes from 0.13 to 0.75 in. are being prepared for the Bureau of Naval Weapons by the Naval Ordnance Laboratory, Silver Spring, Md. Previous standards were for castings with section thickness of more than 0.75 in. Advances in casting techniques and the need for light steel castings to construct aircraft and missiles have, however, made the new standards necessary.

To catalog the defects, which include coldshuts, inclusions, shrinkage, cracks, gas holes, and hot tears, the Navy has contracted with American Brake Shoe Co. to produce a number of castings, each with a single, different defect. Each casting will be radiographed and the defect identified as to type and size. These specimens are to be collected in a reference manual which eventually will be available to the entire steel castings industry.

The research laboratory of Brake Shoe's Engineered Castings Div., Mahwah, N. J., is producing the castings. Compositions being poured include 4130, 4140, 4330 or 4340, 347, 410 or 430, and 17-4 PH. Castings are being made to the Navy's specifications, which include outside dimensions of 6 x 8 in. and thicknesses of ⅛, ⅜, and ¾ in.

The plates are cast with and without taper to produce varying degrees of soundness. Risers are varied in size and sometimes completely eliminated. Chills are used in certain instances, and in others various localized appendages are attached to produce hot spots which in turn generate changing conditions of internal shrinkage. Mold and metal temperature are additional variables. All parts must be made by methods commonly used in the production of aircraft and missile castings.

According to R. J. Ely, assistant chief metallurgist at the laboratory, a typical procedure runs like this:

"We melt 240 lb-heats of 4330 steel in a basic-lined induction furnace. Ferromanganese and ferrosilicon are added following melt down, and the heats are killed with calcium-manganese-silicon and aluminum added at tap. The ladles are basic. Metal is poured at 2900 to 3150° F into ceramic molds. They minimize surface defects which might be detrimental in obtaining proper radiographs."

As many as 240 castings may have to be made to fulfill the specifications. Final size of the reference radiographs will be only 2 x 2¾ in., however, and it sometimes is possible to get more than a single usable x-ray standard from one test plate.

The program grew more difficult as it went along. Initially, it was not difficult to find some portion of a test plate with a specified defect. But as more and more specified defects were obtained, the problem became one of actually making a specific degree of a particular defect.

Produces Titanium Castings in Mild Steel Permanent Molds

A new method of casting small titanium parts in production quantities has been developed by Titanium Metals Corp. of America, New York.

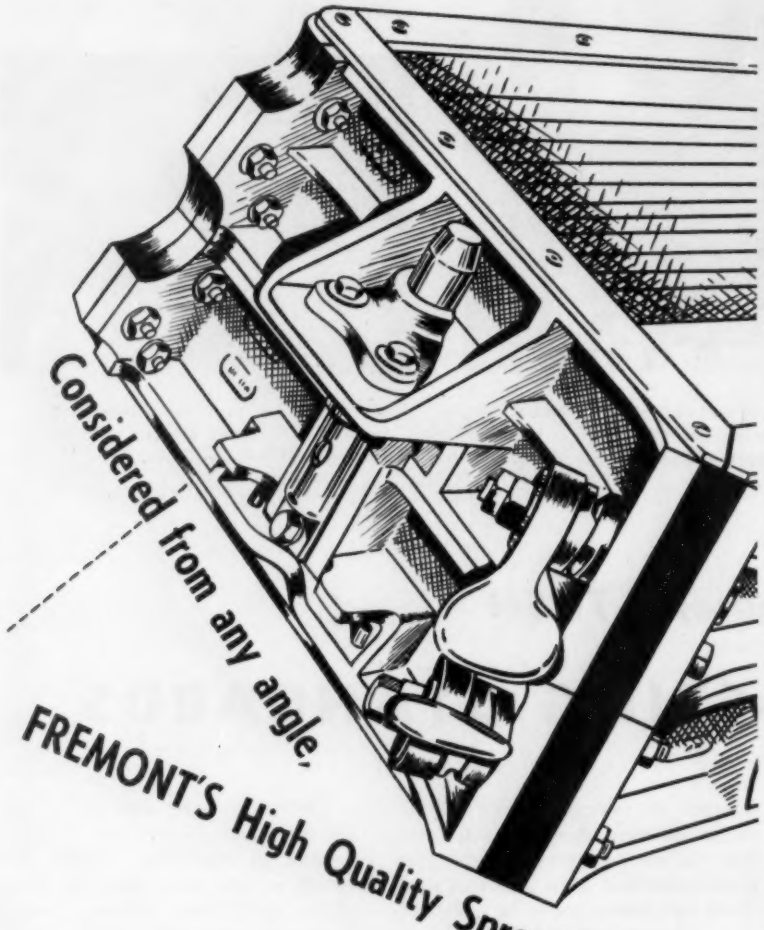
The new process uses mild steel permanent molds and requires a titanium electrode which is double melted. The molten titanium is "impelled" into the mold cavity. In the past, titanium has been cast

Titanium impeller casting 9 in. in diam was cast by new method in a mild steel permanent mold

in graphite molds, and production was limited to from one to about 12 parts per mold. With the new method, up to 100 can be produced.

TMCA's present equipment limits production of castings to weights up to 12 lb, with maximum dimensions of 5 x 10 x 24 in., but larger castings are believed to be possible. Titanium parts weighing up to 148 lb and as large as 24 x 36 x 72 have been made in graphite molds.

"If it wasn't for us coremakers, who would you molders blame for your bad castings?"



are built to do an outstanding job.

There's a lot to be said also about Fremont Standard and Flexible Jackets. Write today for full description and prices.

The Fremont Flask Co., Fremont, O.

only a **CLEAN-LINE**® furnace from hevi-duty brings you . . .

Only "Clean-Line" Heat Treat Furnaces from Hevi-Duty offer so many ways to speed production, cut maintenance and improve output. Consider these advantages:

1. Complete, automatic, "straight-through" operation from loading through quench.
2. Vestibule-housed transfer pusher head only under heat during 9-second transfer cycle. You get trouble-free operation.
3. Expansion seals for radiant tubes are at *cold* end. This system maintains tight atmosphere seal, lengthens tube life.
4. Externally located heat exchanger and pump for easy maintenance and high penetrating oil flow in the quench cycle.
5. Fan circulation for even distribution of heat *without* use of baffles.
6. Compact loading table — just 1½ baskets long — for savings in floor space.
7. Fuel-fired or electric models available.
8. Special options — automatic quench retractor, double-chamber design for two independent temperatures and two independent atmospheres, temperatures to 2100°F.

Suitable for carbonitriding, carburizing, bright hardening, annealing, normalizing and brazing, the standard "Clean-Line" furnace is used for heat treatment of metal to 1850°F. Complete systems are available . . . including heat treat and quench unit, gas generator, washer and tempering furnace.

Hevi-Duty's "Clean-Line" furnace is just one in a full range of products: heat treating furnaces, ferrous and nonferrous metal melting and holding furnaces, and industrial ovens — all available fuel-fired or electric. Get full details from your Hevi-Duty sales engineer or write to Hevi-Duty, Watertown, Wisconsin, for Bulletin D 100A.

See it at the Western Metal Show. Booth No. 187

HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

Hevi-Duty Electric Company, Watertown, Wis.

A Division of Basic Products Corporation

For More Information Circle 649, Page 39

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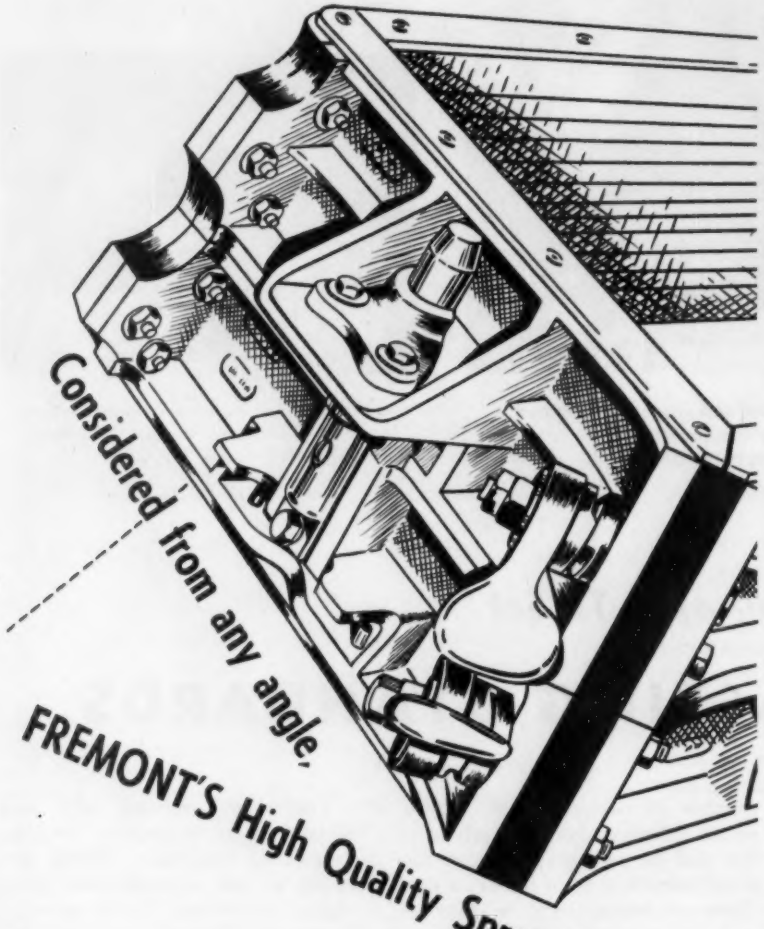

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Only "Clean-Line" Heat Treat Furnaces from Hevi-Duty offer so many ways to speed production, cut maintenance and improve output. Consider these advantages:

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Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

Hevi-Duty Electric Company, Watertown, Wis.

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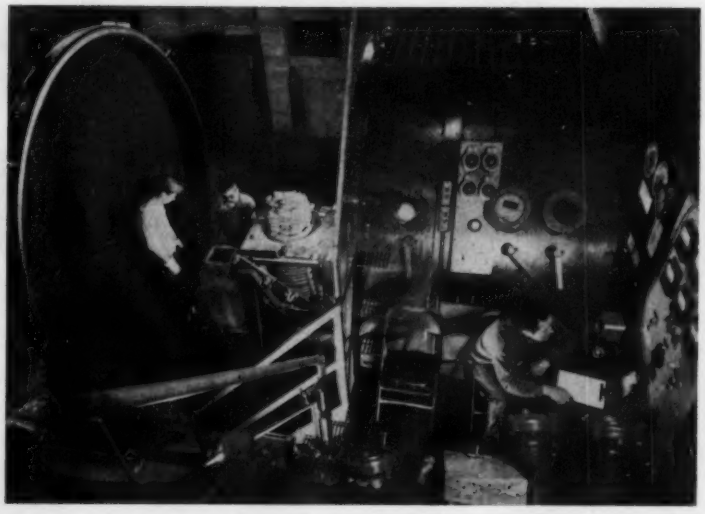
For More Information Circle 649, Page 39

Developments Expected To Broaden

INVESTMENT CASTINGS MARKET



Master heats of vacuum alloys are melted and refined in this 1500-lb unit which is 8 ft long and 12 ft in diam

● INCREASED UTILITY of investment castings, resulting in a broader market, is anticipated by Haynes Stellite Co., Kokomo, Ind., a division of Union Carbide Corp. This optimistic view results from four recent company developments in investment casting production:

Controlled Grain Size—Castings can be produced with grain size controlled so that optimum benefit can be obtained from the alloy used. The company is prepared to produce castings in which grain size is specified in the same manner as surface finish and dimensional tolerances. Grain size can be varied in a single casting to provide desired properties in various areas of the cast part.

Turbine blades produced by the company are cited as an example of the benefit of controlled grain variation. Some blades with a 1/16-in. grain throughout developed cracks along their trailing edges where thermal shock is most severe. Blades now are produced with 1/64-in. grains in the trailing edges and 1/16-in. grains in the bodies.

The relatively fine grain structure offers resistance to thermal shock and fatigue. The coarser grain structure is credited with good rupture strength. Nickel-base alloys are used with aluminum and titanium additions up to 11 per cent to improve high temperature properties.

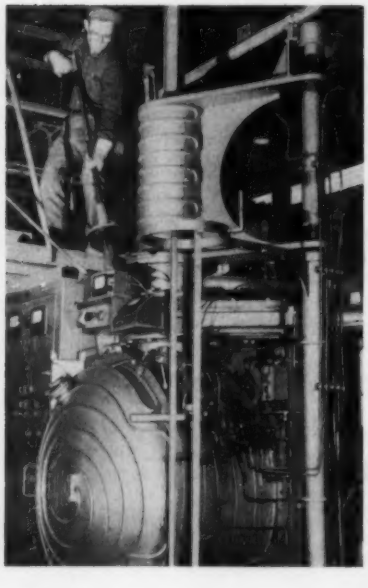
Improved Coring—The use of preformed ceramic cores inserted into patterns is said to offer investment casting engineers additional freedom in cast parts design. Cored holes with length-to-diameter ratios of over 200:1 in lengths up to about 8 in. have been produced in castings on a development basis. In production, cored holes with a 30:1 ratio for lengths up to about 10 in. have been investment cast.

The ratio obtainable with ordinary coring methods is said to be about 6:1 for somewhat shorter lengths. Company engineers point out, however, that the additional cost of using preformed ceramic cores makes their use uneconomical for short runs of castings.

Protective Coatings — Diffusion coatings of nickel-aluminum or iron-aluminum materials being applied to castings on a semiproduction basis promise to extend the application temperature range of many existing alloys. Useful oxidation resistance has been imparted to certain alloys at temperatures near their melting points. Resistance to residual fuel ash also has been indicated.

Use of Vacuum—Haynes Stellite Co. operates a rather extensive vacuum melting and casting department (see FOUNDRY, October 1959, p. 82, for descriptive story). Current capacity is 90,000 lb of vacuum-poured castings a month at a rate of 400 molds a day. That volume will not tax the company's primary vacuum refining facilities for producing 300,000 lb a month.

Over 350,000 vacuum investment castings have been sold and the company anticipates increased demand. That is expected to be for castings of nickel-base, precipitation hardening alloys and of reactive metals.



Operator is charging alloy into air lock at top of chamber on a continuous vacuum unit

Stop time in its tracks...

TODAY...

YOU CAN BAKE CORES IN MINUTES...

INSTEAD OF HOURS... WITH A

DELTA FAS-BAKE RESIN

USING YOUR PRESENT EQUIPMENT...

...SAND MIXES...MULLERS...CORE BOXES...OVENS...PEOPLE

Delta Fas-Bake Resins are a new development in the field of core binders... making possible new economies, new competitive advantages . . . new, improved core room and pouring floor schedules.

You don't have to change a thing . . . except your core binder. You increase core production by cutting baking time. You cut core making costs by saving time, labor and fuel. You get better, stronger cores, clean and sharp. You can stockpile cores or work on a day-to-day, or hour-to-hour schedule. Cores made with DELTA FAS-BAKE RESINS have excellent shelf life . . . ready for use immediately.

Your Delta Foundry Technician will willingly cooperate with you in evaluating the use of DELTA FAS-BAKE RESINS in your core room. He will provide the necessary samples, literature for use, and counsel to enable you to get maximum results in your operations.

over quarter of a century

DELTA

GOOD TO THE CORE

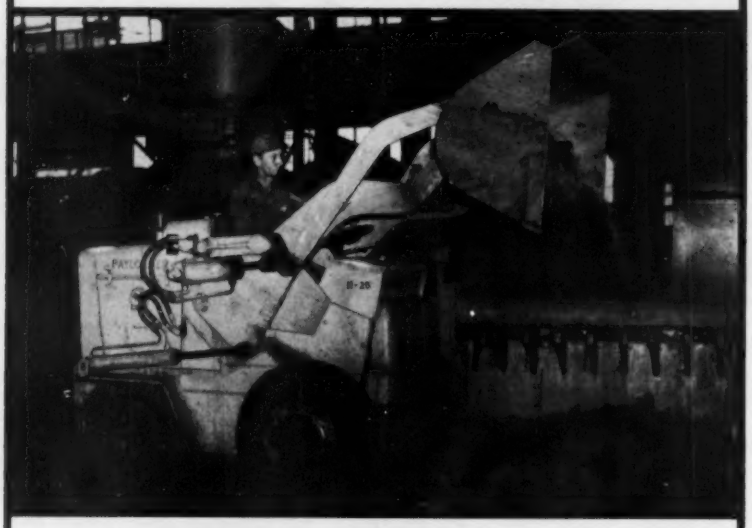
DELTA OIL PRODUCTS CORP.

MANUFACTURERS OF

SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WIS.

Ease the profit squeeze



with PAYLOADER® economy

Here's what users say about the Model H-25:

Power and Capacity—"We tried an H-25 'PAYLOADER' and it gave us the productivity and economies without having to install conveyors and other costly material handling equipment." . . . "Before purchasing the H-25 we had competitive demonstrations that proved its production efficiency over other machines."

Speed and Maneuverability — The H-25 "is doing a top production job. Power-steer and power-shift combination gives us maximum efficiency from both machine and operator." . . . "I find it fast and efficient. It has power to get the job done quickly and is easy on the operator."

Easy Operating — "Power steering and no clutch is a must. You can get full loads without spinning wheels and the operator lasts longer too." . . . "I like the maneuverability and work capacity."

Reliable — "We find they stand up under tough, rugged duty with minimum repairs." . . . "The maintenance on our two H-25's has been lower than on any loader previously used." . . . "Its rugged construction stands up under rough working conditions with simple maintenance."

Profitable Performance: These reports from many owners of the 2,500-lb. capacity Model H-25 reflect the kind of outstanding performance that is built into all "PAYLOADER" units. Whatever your material handling problems may be, there is a proper size "PAYLOADER" to do the job more efficiently. There is a wide selection of 20 models in 8 capacity ranges to meet every handling need. If you want to "ease the profit squeeze" in your operation, contact your nearby Hough Distributor for a demonstration, or return the coupon below for more complete information.

HOUGH®

THE FRANK G. HOUGH CO.
703 Sunnyside Ave.
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SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

☐ Send H-25 "PAYLOADER" data
☐ Larger "PAYLOADER" units to 12,000 lb. operating capacity

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Title _____
Company _____
Street _____
City _____
State _____

4-A-3

Investment Casters To Sponsor Technical Conference at Case

A technical course which will examine melting and solidification behavior in investment casting will be sponsored by the Investment Casting Institute at Case Institute of Technology, June 20 and 21.

Lectures during the two-day intensive industry conference will include the following: "Fundamentals of Melting and Solidification Behavior of Metals" by J. F. Wallace, Case; "Employment of Melting and Solidification Principles in Investment Castings" by M. C. Flemings, Massachusetts Institute of Technology; "Principles of Heat Flow in Refractory - Molten Metal - Atmosphere Systems" by C. M. Adams Jr., MIT.

"Theory of Gating and Risering Applied to Investment Casting" by J. F. Wallace, Case; "Causes and Prevention of Hot Tears in Investment Castings" by John Zotos, Northeastern University; and "Influence of Investment Casting Variables in Heat Flow" by Hyman Rosenthal, Frankford Arsenal.

In addition, representatives from industry will participate in panel presentations to discuss gating and risering practices for both ferrous and nonferrous metals.

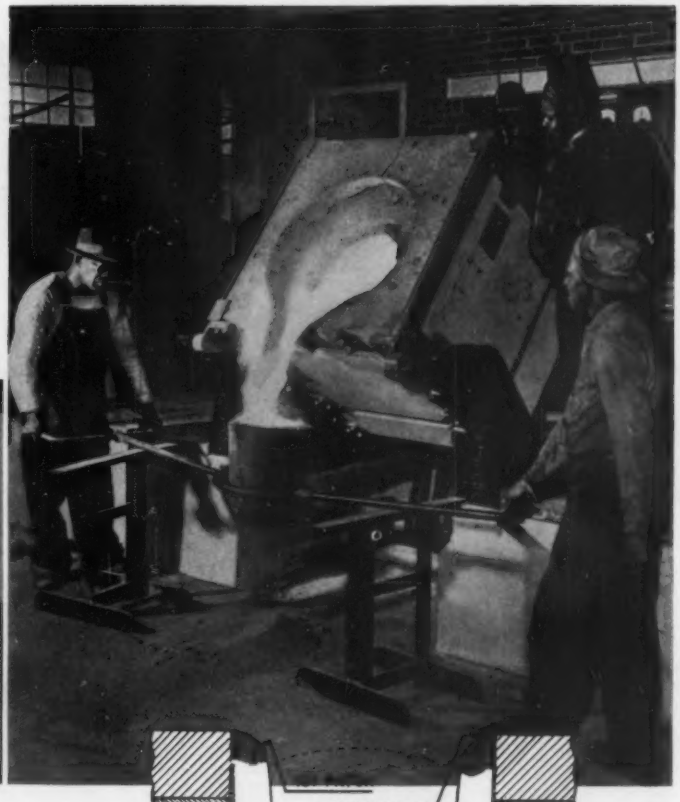
The course will be open to all who are interested in investment casting and precision casting technology. Additional information can be obtained by writing directly to the institute, at 27 East Monroe St., Chicago 3, Ill.

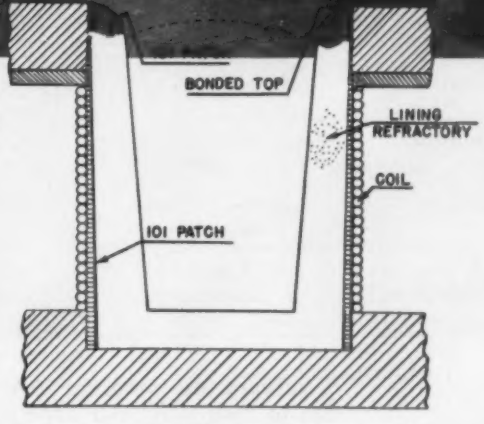
ASM To Award Diplomas For Courses in Metallurgy

An extension diploma program has been authorized by the trustees of American Society for Metals for its home study division, the Metals Engineering Institute, at Novelty, Ohio. The diploma will be awarded for completion of a prescribed sequence of 5 of the more than 20 metallurgical courses offered by the institute. Course work sequences of interest to foundrymen which will earn diplomas include ferrous metallurgy, nonferrous metallurgy, and metallurgical processes. An additional course work sequence now in the advanced planning stage covers foundry metallurgy.

USE

TASIL NO. 101 PATCH





for high frequency induction furnaces

TASIL (Taylor Sillimanite) No. 101 Patch is widely used by operators of high frequency induction furnaces for coating of the inner surface of the water-cooled, primary coil. When air dried, this coating will:

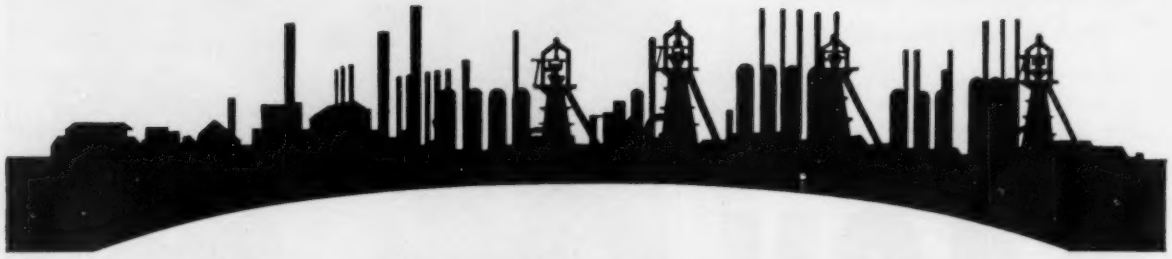
1. **Protect the coil when the crucible is being rammed in place.**
2. **Protect the coil from damage in the event of a leakage of metal through the lining proper.**

Properties which qualify TASIL No. 101 Patch for this service are: *high di-electric strength . . . smooth working properties . . . softening point above 3200° F. . . . negligible shrinkage or expansion . . . can be used with either an acid or basic lining.*

There is a complete line of TASIL (mullite), TAYCOR (corundum-base) and TAYLOR ZIRCON Ramming Mixes and Cements for every metallurgical need. Write for recommendations to cover your melting requirements.

The CHAS. TAYLOR SONS Co.
A SUBSIDIARY OF NATIONAL LEAD COMPANY
REG. U. S. PAT. OFF.
REFRACTORIES SINCE 1864 • CINCINNATI • OHIO • U. S. A.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.



Woodward Iron Grades Are Flexible and Diversified

Flexibility and diversity of Woodward iron grades is widely known throughout the foundry industry. This table shows:

Woodward Pig Iron—Typical Grades

GRADE	SILICON	SULFUR	PHOSPHORUS	MANGANESE
Basic	Up to 1.50% (as ordered)	0.05% Max.	0.10-0.30 or 0.30-0.70 or 0.70-0.80% (as ordered)	0.40-2.00% (as ordered)
Malleable	1.00 to 3.50% (as ordered)	0.05% Max.	0.10-0.30%	0.20-2.00% (as ordered)
Foundry	1.00 to 3.50% (as ordered)	0.05% Max.	0.301-0.70% (as ordered)	0.20-1.50% (as ordered)
Foundry (High Phos.)	0.75 to 3.50% (as ordered)	0.05% Max.	0.70-0.90% Up to 1.50% (as ordered)	0.20-1.50% (as ordered)

Woodward also produces irons for operations requiring special analyses due to their particular application to out-of-the-ordinary types of casting. Whatever type of quality iron your company requires, you can be sure that Woodward can meet your specifications.

For quotations, write or call our Sales Department, Woodward, Ala.

Phone Bessemer, Ala. HAmilton 5-2491

or Sales Agents for Territory north of Ohio River:

HICKMAN, WILLIAMS & COMPANY, 230 North Michigan Ave., Chicago 1, Ill.

Offices in Principal Cities

WOODWARD IRON COMPANY

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1882

. . . MEN of INDUSTRY

WILLIAM H. JOHNSON
. . . technical director

A. DONALD MOLL

CARTER DE LAITTRE
. . . Minneapolis Electric Steel officers

EGON VON MAUCHENHEIM
. . . Knight v. p.

DURWARD L. ROBERTSON
. . . executive vice pres.

William H. Johnson has been named technical director of the Centrifugal Casting Div., Shenango Furnace Co., Dover, Ohio. He was senior metallurgist, Process Metallurgy Div., Battelle Memorial Institute, Columbus, Ohio.

Leo Reierstad has been named general sales manager of Permanent Mold Die Co., Hazel Park, Mich., and its subsidiaries—Piston Mold Co. and PMD Extrusion Die Co. He was export sales manager, Aluminium Limited Sales Inc., Montreal, Que.

Arthur P. McGinnes Jr. has been appointed manager-product development, Beryllium Corp., Reading, Pa. Mr. McGinnes was manager of American Non-Gran Bronze Co., Berwyn, Pa., before he joined Beryllium Corp. **Drew W. Perkins** has been appointed engineering director, Beryllium Corp. He formerly was manufacturing-engineering superintendent, Olin Mathieson Chemical Corp.

Carter DeLaittre, formerly works manager, has been elected vice president and works manager, Minneapolis Electric Steel Castings Co., Minneapolis. **A. Donald Moll,** formerly sales manager, has been elected vice president and sales manager. Officers re-elected include **Robert C. Wood,** president; **William E. Niemackl,** vice president; and **Orvel A. Bakke,** secretary and treasurer.

Benjamin S. Head has been appointed general superintendent of the Defiance, Ohio, plant, Central Foundry Div., General Motors Corp. **Donald R. Dunlap,** named production manager to succeed Mr. Head, formerly was superintendent of the aluminum department at the Defiance plant.

Egon von Mauchenheim has been made vice president of Lester B. Knight & Associates Inc. and concurrently becomes manager of its German affiliate, Lester B. Knight & Associates G.m.b.H, Dusseldorf. He has served as consultant to the National Industrial Conference Board and to the U. S. Department of State Broadcasting Services.

Durward L. Robertson, formerly vice president, has been named executive vice president, Apex Steel Corp. Ltd., Los Angeles. He remains general manager of the foundry and machine press divisions. **James W. Halverson** has been promoted from assistant secretary to secretary-treasurer.

W. J. Rave has been named manager of the newly formed metals department of Dow Chemical Co., Midland, Mich. He formerly was manager of magnesium production

LEO REIERSTAD
. . . general sales mgr.

ARTHUR P. McGINNES JR.

DREW W. PERKINS
. . . join Beryllium Corp.

DONALD R. DUNLAP

BENJAMIN S. HEAD
. . . changes at Central Foundry Div.

DONALD L. MOORE
. . . Baroid sales mgr.

ROY A. FROST
. . . Vanadium Corp. appointments

ROBERT F. JONES
. . . Vanadium Corp. appointments

HUBERT A. BERNET JR.
. . . sales mgr.-engineering

DAN PENDERGAST
. . . foundry oven sales

in the firm's Texas Div. **Hilary A. Humble** has been appointed sales manager of the department. **William S. Loose,** formerly manager of magnesium sales, has been assigned to Dow's industrial relations staff.

Donald L. Moore has been appointed sales manager for Baroid Chemicals Inc., with headquarters in Houston. **Howard G. Monroe,** assistant sales manager, will have direct supervision of sales to the foundry industry.

Frank O. Anderson II has been appointed plant manager, Chrysler Corp.'s American Foundry Plant, Indianapolis. Recently he was manufacturing manager of the company's diecasting plant in Kokomo, Ind.

Thomas F. Gallagher has been named general sales manager, Davis Fire Brick Co., Oak Hill, Ohio, and its associated companies—Sivad Ceramic Corp., Ohio Fire Brick Co., and Cambria Clay Products Co. He has been associated with the refractories industry for the last 15 years.

Roy A. Frost has been appointed service engineer in Chicago for Vanadium Corp. of America. He joined Vanadium in 1957 and formerly was product metallurgical engineer at the company's research center in Cambridge, Ohio. **Robert F. Jones** has been made district representative in Cleveland. He joined the firm in 1959 as a sales trainee at the research center in Cambridge, Ohio.

J. Stewart Cruickshank has been promoted to Milwaukee works manager, International Harvester Co., Milwaukee, Wis. He formerly was assistant works manager and succeeds **William C. Brice.** Mr. Brice has been named assistant manager of the company's research center in Chicago, Ill. **Victor A. Guebard Jr.,** formerly foundry general superintendent, has been promoted to general superintendent of the Milwaukee works.

John S. Howey and **Edgar E. Jones** have been appointed direct factory representatives in the Pittsburgh area for Rotor Tool Co., Cleveland. Mr. Howey has had wide experience in industrial, management and engineering fields. Mr. Jones, formerly with the Cleveland Browns professional football team, also has had considerable sales experience in industrial equipment.

Hubert A. Bernet Jr. has been appointed sales manager-engineering for Webster Mfg. Inc., Tiffin, Ohio. He served as the company's Cincinnati assistant district manager for the last five years.

Dan Pendergast, Commercial Bldg., Waltham, Mass., has joined Foundry Equipment Co., Cleveland, as New England sales representative.

Robert W. Hanna Jr. has been appointed manager of the Pittsburgh district office and warehouse of Link-Belt Co., Chicago. He joined the company at its Philadelphia foundry in 1941 and has been Pittsburgh district engineer since 1948. Mr. Hanna succeeds **Otto W. Werner,** district manager for the last 15 years, who will devote his time to engineering contract sales.

Norbert F. Rincker, manager of x-ray sales, has been given additional responsibilities for the plan-

THOMAS F. GALLAGHER
. . . Davis sales mgr.

EDGAR E. JONES
. . . Rotor Tool Co. representatives

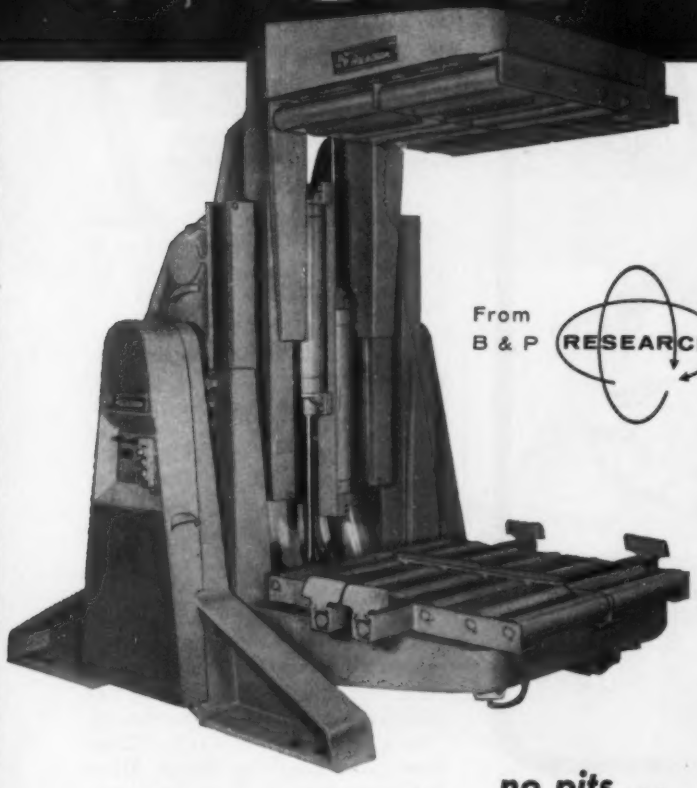
JOHN S. HOWEY
. . . Rotor Tool Co. representatives

ROBERT W. HANNA JR.
. . . becomes Pittsburgh mgr.

NORBERT F. RINCKER
. . . Ansco Div. promotion

Circle 654 on Page 39→

CUT THE COST OF MOLD HANDLING



From B & P RESEARCH

no pits . . .

easy, inexpensive installation

ALL-HYDRAULIC
ROL-A-DRAW

FAST, COMPLETELY AUTOMATIC CYCLE . . . cuts production time, ends costly errors.

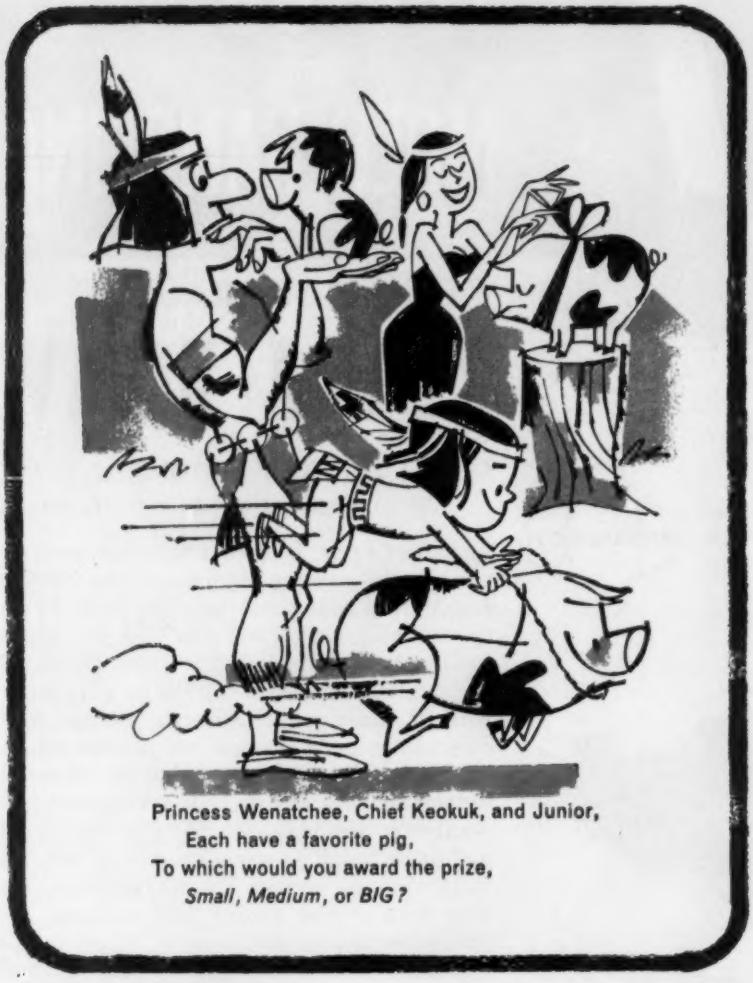
As part of a new, modern installation, or as an addition to existing equipment, the flexible Rol-A-Draw cuts mold handling costs to an unbelievably low figure. Available in capacities up to 15,000 pounds, the Rol-A-Draw will accommodate any flask within its wide range without machine adjustments. Clamp, roll-over, draw, mold ejection and pattern return are accomplished by push-button-actuated automatic cycle control thus saving time and manpower. Crane delays are cut or eliminated and other handling costs are sharply reduced to provide big savings. Smooth, accurate pattern draw assures perfect mold surfaces . . . eliminates mold repair.

Efficient mold handling saves money . . . and Rol-A-Draw makes mold handling efficient. Why not contact your Beardsley & Piper representative for complete Rol-A-Draw information. He will be happy to help evaluate your mold handling problems.

meets all production requirements . . . uses existing patterns and flasks . . provides outstanding accuracy

BEARDSLEY & PIPER Div. of Pettibone Mulliken Corp. 2424 N. Cicero Ave., Chicago 39, Ill.

MEMBER FEMA



Princess Wenatchee, Chief Keokuk, and Junior,
Each have a favorite pig,
To which would you award the prize,
Small, Medium, or *BIG?*

When you think of SILICON . . . think of KEMCO!

KEMCO SILVERY PIG IRON

SILICON METAL—OTHER FERROALLOYS

Small . . . 12½ pound piglets
Medium . . . 30 pound pigs
Large . . . 60 pound pigs

Keokuk Electro-Metals CO.
Division of Vanadium Corporation of America
Keokuk, Iowa • Wenatchee, Washington

Sales Agent: Miller and Company
Chicago 4, Illinois, 332 S. Michigan Avenue
Cincinnati 2, Ohio, 3504 Carew Tower
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The superior form of silicon introduction . . . available in 60 and 30 lb. pigs and 12½ lb. piglets . . . In regular analysis or alloyed with other elements. For uniform high purity, aluminum producers specify Kemco Silicon Metal.

RICHARD M. GREGORY
. . . ADM West Coast mgr.

ning and sales of all x-ray products of Ansco Div., General Aniline & Film Corp., Binghamton, N. Y. He joined Ansco in 1949.

Richard M. Gregory has been appointed West Coast manager, Archer-Daniels-Midland Co., Federal Foundry Supply Div. He joined ADM in 1957 as technical service engineer and has served in both field service and sales training capacities. He will be headquartered in the company's Los Angeles regional sales office.

Thomas H. Ginsburg has been appointed vice president-plant manager and **Alfred S. Dubinsky** vice president-raw material purchasing, Alloys & Chemicals Corp., Cleveland. Mr. Ginsburg joined Alloys & Chemicals in 1957 and served successively as production manager and plant manager. Mr. Dubinsky, who joined the company seven years ago, has been director of purchases since 1958.

O. H. Kastens has been appointed central region district manager, Newaygo Engineering Co., Newaygo, Mich. He joined the company

O. H. KASTENS
. . . Newago dist. mgr.

Action When Our Customers Need it Most!

Shipped on an interim basis, this high frequency induction furnace got an Inductotherm customer back into business less than 24 hours after an unfortunate pouring accident temporarily put his old unit out of commission. Such service is part of Inducto's concept of doing business . . . an obligation we feel to keep every customer's furnaces pouring on schedule regardless of emergencies. Should trouble develop, Inductotherm usually has a trained engineer on the spot in a matter of hours. Emergency orders are stamped for special priority . . . replacement parts shipped immediately from Inducto's complete inventory—all to assure that your work will be started at once and continued into overtime if necessary.

But service is only one of the overall cost-saving benefits Inductotherm offers. For a look at the entire story, ask to have an Inducto engineer call. Inductotherm Corporation, 412 Illinois Ave., Delanco, N. J.

INDUCTOTHERM

HERE IT IS IN BLACK & WHITE

that Security's **Pre-Alloyed Furnace Charges** cost less than their original components. *Proof that in each one-thousand-pound heat in an induction furnace,* **Pre-Alloyed Furnace Charges** *will save you money.*

TYPE 304 STAINLESS VIRGIN COMPONENTS		
5	Lbs. Manganese	$ 1.75
5	Lbs. Silicon	.95
265	Lbs. Ferro-Chrome 70%	64.00
90	Lbs. Nickel	66.60
1.5	Lbs. Calcium/Silicon	.39
635	Lbs. Ingot Iron	47.78
		$181.47

TYPE 304 STAINLESS PRE-ALLOYED FURNACE CHARGES

1000 LBS. $.14 LB.* $140.00

*Average price for type 304 paid first half year 1960

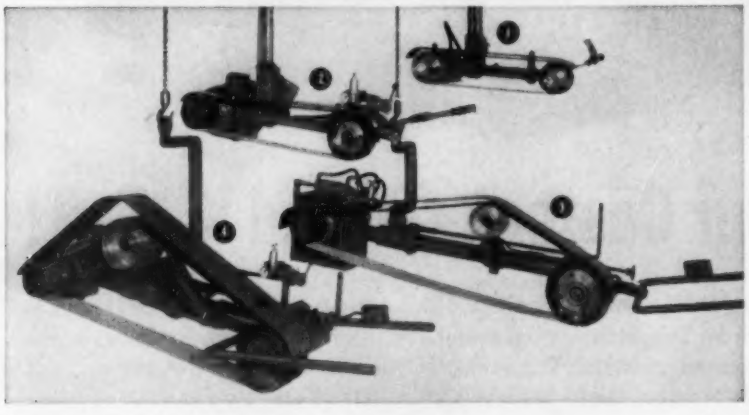
This comparison reveals a charge savings in excess of $40.00. Think of the additional savings in reducing the necessity of multiple purchase orders, freights, handling and storage. Time consuming **Charge Make Up** is eliminated also because Alloying has already been done for you.

For more information on type 304 Stainless Steel or other Nickel Alloys Contact
FOUNDRY DIVISION

SEND FOR FREE POCKET-SIZE ALLOY SLIDE CHART
Complete analysis of over 100 nickel-cobalt alloys

SECURITY ALLOYS CO. INC
3100 West 49th Place, Chicago 32, Illinois

For More Information Circle 657, Page 39



ABRASIVE BELT SWING GRINDERS

Job-Rated to Your Needs

A FULL LINE OF 20 STANDARD MODELS for ALL General and *most* specific production requirements.
1. G & P 6-72 Unit **2.** Medium Duty Units
3. Heavy Duty Units **4.** Xtra Heavy Duty Units
Available from 2 HP up. Air or Spring Tensioning. Belt sizes 2" thru 6" x 72" thru 132" long.

The *right* combination of size and power will fit YOUR job, whether *Weld Removal, Casting Clean Up or Polishing.* Belt Swings can SAVE you money.
Write for literature.

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INDIANAPOLIS 5
INDIANA

Grinding and Polishing Machinery Corp.

For More Information Circle 658, Page 39

ROBERT L. SNOOK
. . . becomes dept. mgr.

15 years ago and until recently was manager of territorial sales in Newaygo.

Robert L. Snook has been named manager of the industrial department, Magnet Cove Barium Corp., Houston, succeeding **George H. Moore,** recently named vice president-marketing. Mr. Snook has been acting manager since Mr. Moore's appointment.

Howard C. Sheperd has been named chairman of the board of Atlas Copco Inc. He formerly was chairman of the First National City Bank, New York. **Peter Redpath,** formerly vice president-sales, Canadair, a subsidiary of General Dynamics, was elected president. **C. E. Burton,** formerly vice president of Atlas Copco Pacific, has been named executive vice president and will operate from San Carlos. **R. G. Chambers** has been appointed vice president in charge of the Eastern Division, in Paramus, N. J.

Donald E. Shryock has been appointed field representative in the Chicago and midwestern sales area, Arcair Co., Lancaster, Ohio.

DONALD E. SHRYOCK
. . . midwest sales, Arcair Co.

if a

BIG saving

...IN STEEL ABRASIVE COSTS IS IMPORTANT TO YOU...

you certainly should investigate **"SUPER-STEEL"**
SHOT OR GRIT

★ It costs only **$165.00** per ton, truck loads — considerably less than competitive steel abrasives!

★ It's unequivocally *guaranteed* to equal the performance of all higher priced steel abrasives!

★ It equals, or exceeds, "resistance-to-breakdown" ratings of higher priced steel abrasives!
(Checked on SAE-approved, Mattson-Cargill shot life testers.)

★ It's doing an excellent job of cleaning in foundries and descaling in steel and metalworking plants.
(Should you desire first-hand information from actual users of "SUPER-STEEL", write us for names of firms in your area.)

We'll gladly rush a trial order, additional information or have our sales engineer call.

METAL BLAST, INC.

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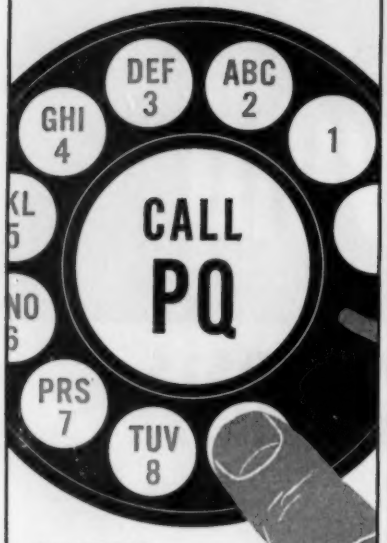
ALSO IN: Chattanooga - Chicago - Cincinnati - Dayton - Detroit - Elberton, Ga. - Grand Rapids - Greensboro, N. C. Houston - Los Angeles - Louisville - Milwaukee - Minneapolis - New York - Philadelphia - Pittsburgh and St. Louis.

MANUFACTURERS, ALSO, OF TOP QUALITY "SEMI-STEEL" SHOT AND GRIT, MALLEABLE AND CHILLED SHOT AND GRIT — AT COMPARABLE SAVINGS!

FOR SODIUM SILICATES



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TEST SHIPMENT?
REGULAR SUPPLY?

Prompt complete service is assured you from PQ's

- **extensive line—over 50 liquid products, 25 powders**
- **convenient deliveries from 9 plants; less truckloads from distributor stocks in 80 cities**
- **broad experience in manufacturing silicates and helping industry use them (a century's accumulation)**

Our number is MArket 7-7200 (area code 215); or write us.

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manufacturers of
SOLUBLE SILICATES

100TH ANNIVERSARY 1831-1941

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Associates: *Philadelphia Quartz Co. of California Berkeley & Los Angeles, California; Tacoma, Wash. National Silicates Limited, Toronto & Valleyfield, Canada.*

PQ PLANTS: ANDERSON, IND.; BALTIMORE, MD.; BUFFALO, N.Y.; CHESTER, PA.; JEFFERSONVILLE, IND.; KANSAS CITY, KANSAS; RAHWAY, N.J.; ST. LOUIS, MO.; UTICA, ILL.

For More Information Circle 660, Page 39

OBITUARY

Thomas S. Hodge, 82, founder of W. S. Hodge Foundry Inc., Greenville, Pa., died Feb. 3. At the age of 14 he joined the Hodge Mfg. Co., founded by his father in 1876. He was molder, foreman and then superintendent until the company was dissolved in 1937, when he started the W. S. Hodge foundry.

THOMAS S. HODGE

He retired seven years ago after 61 years in the foundry industry. Two sons and a grandson continue the business today.

Edward W. Campion, 77, chairman of the board, the Bonney-Floyd Co., Columbus, Ohio, died March 1. Mr. Campion was with Buckeye Steel Castings Co., Columbus, until 1933 when he joined Bonney-Floyd Co. as general manager, and later became president. Active in the Steel Founders' Society of America, he was also a former director of the American Foundrymen's Society.

Marshall D. King, 54, foundry superintendent, Hills-McCanna Co., Chicago, died Feb. 9, after more than 20 years with the company.

Daniel Molander, 89, one of the founders of the H. C. Macauley Foundry Co., Berkeley, Calif., died there Feb. 25.

Gloster P. Hevenor, 72, president and chairman of the board, Deynor Corp., Mamaroneck, N. Y., which he formed five years ago, died recently. Previous connections included president, Aquadyne Corp., New York, executive vice president, Johnson March Corp., New York, and general manager, Hevenor & Weller, consulting engineers.

Reinhart H. Schramm, 61, former assistant sales manager of the cast iron division of James B. Clow & Sons, Chicago, died March 8. Prior to recent retirement, he had been with the company 37 years.

John Shanafelt, 88, chairman of the board, the Shanafelt Mfg. Co., Canton, Ohio, foundry product suppliers, died Feb. 12.

Marner E. Stewart, 50, chief metallurgist, Wells Mfg. Co., Skokie, Ill., died Feb. 21, after more than 12 years with the company.

1960 Material Handling Sales Show Slight Drop from 1959

Sales of industrial material handling equipment manufacturers in 1960 showed a drop of 7 per cent from the 1959 bookings. The December index of the Material Handling Institute Inc. showed that the average dollar volume of incoming orders for manufacturers in 1960 was 122.55, based on an index of 100 for the 1954 average. The over-all average during 1959 was 131.85.

According to Robert F. Moody, president of MHI and general sales manager, Hyster Co., Portland, Oreg., many material handling equipment users indicate that they are more encouraged about future prospects than the manufacturers in this industry. Many of these customers are looking for a pickup in business fairly early in 1961.

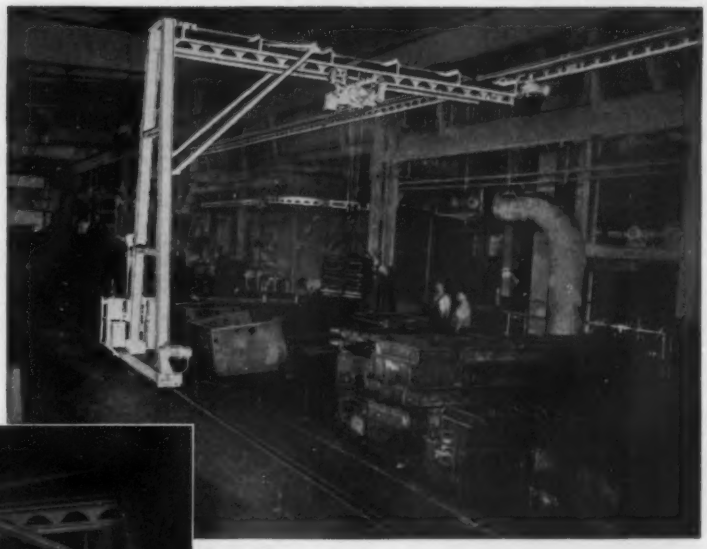
Book Review

Engineer's Handbook, **192 pages, 2⅝ x 5½ in., published by Ottenheimer Publishers Inc., 4805 Nelson Ave., Baltimore 15, Md. Price 90c.**

Handbook is composed of 250 items discussing properties of structural steel, strength of gear teeth, cost estimating, properties of minerals, chemical solubility, thermal stress, resistance, and other information.

Book is indexed alphabetically and also contains a chart and table index and 12 marginal indexed headings.

Gantry Cranes Save Foundries Time and Money



▲ This completely motorized Tramrail gantry crane handles molds to the shakeout. It works under heavy overhead cranes which are free to travel over it without interference.

◀ 2-ton gantry crane in core storage section. One of four gantries on the same runway operating under an overhead traveling crane, providing handling service for local areas.

5-ton completely motorized gantry crane in a ladle repair room. The gantry makes it an easy job to move ladles around as desired for relining and necessary repairs. ▼

BECAUSE Cleveland Tramrail gantry cranes are easily installed to operate under other cranes or overhead materials handling systems, many foundries have found them very valuable. They provide additional materials handling service so often needed for local or spot handling in various areas without interference with existing top-running cranes.

Much time lost by workers waiting for crane service is saved when gantry cranes are provided. Because they are relatively inexpensive, several can usually be purchased for less than the price of a standard overhead crane.

WRITE FOR FREE COPY of Engineering and Data Booklet No. 2008. Packed with helpful information

CLEVELAND TRAMRAIL

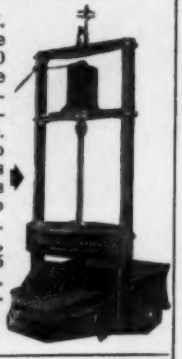
Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3842 E. 286 ST. • WICKLIFFE, OHIO

GET PRECISION ACCURACY with Combs Gyratory Riddles

"Greatest Name in Motion"

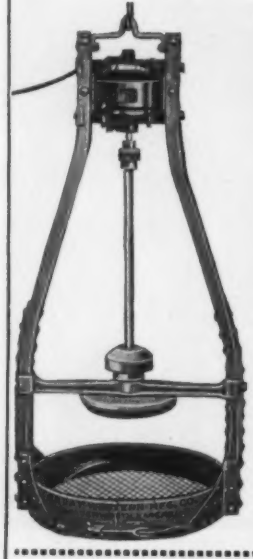
TYPE "CS". Complete price $435.00 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ½ H.P. enclosed motor.



TYPE "CR". Complete price $425.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.

TYPE "HL". Price $315.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House



TYPE "V". Price, 20" Sieve, $330.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $600.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas **Phone MU-22291**
☐ Send Additional FREE Information
NAME
ADDRESS
CITY STATE

For More Information Circle 662, Page 39

Let us know your specifications on welded constructions. We have up-to-date facilities for production of carbon or stainless steel and aluminum, from 1/16" to 4" thick.

Call or write for estimate. You'll find it economical to work with us on your requirements for tanks, chutes, hoppers, machine bases, stacks, breechings, angle rings, special cars, buckets and other equipment.

PENN IRON WORKS, INC.
READING, PA. Phone FRanklin 6-4826

For More Information Circle 663, Page 39

WITH A GRACO *FAST-FLO* PUMP

Transport your liquids or semi-liquids to point of use with a Graco Fast-Flo Pump . . . *and show tremendous savings by cutting unnecessary plant traffic.*

Air powered, the Fast-Flo doesn't require expensive electrical wiring. Fits all standard drums.

Some plants handle up to 25 different materials this economical Graco way.

Investigate today. See how you can profit with Graco direct-from-drum transfer pumps in your plant.

GRACO ENGINEERS & MANUFACTURERS
GRAY COMPANY, INC.
425 Graco Square
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See Phone Book Yellow Pages "Spraying" for Graco Suppliers

For More Information Circle 664, Page 39

GREATER GRINDING EFFICIENCY ... LOWER "PER UNIT" COSTS

ALPHA
GRINDING WHEELS

Designed for fast action wherever quick metal removal is required. Their longer cutting life means more metal removed per disc wheel — reducing "per unit" production costs. And, because of this more efficient cutting action, Alpha disc wheels do not cause operator fatigue.

Made from abrasive grain and resinoid bond, Alpha disc wheels are strong and durable. Triple reinforcement provides greater safety while in operation.

Alpha grinding disc wheels are manufactured in 7 and 9 inch diameters in a complete range of grain sizes from 14 to 120.

Write today for full information.

Atlantic Abrasive Corp.
A DIVISION OF ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

For More Information Circle 665, Page 39

Pattern Insurance

This FEDERAL Shovel Handle with a rubber pien grip for ramming, absolutely will not damage patterns or core boxes.

...and it costs only $1.50

This is one of the 230 useful foundry products available through a network of 50 ADM warehouses.

Archer-Daniels-Midland
FEDERAL FOUNDRY SUPPLY DIVISION
2191 West 110th Street
Cleveland 2, Ohio

For More Information Circle 666, Page 39

NEW TRENDS CALL FOR NEW METHODS

MOCO Ovens Keep Pace With Forward-Looking Foundries

Increased output at lower cost per unit is the result when you specify industrial ovens *custom-engineered* for your application. That's why Michigan Oven Company heat treating equipment is best for aluminum alloy processing. MOCO-engineered ovens are backed by years of technical research to insure maximum heat processing efficiency.

Michigan Oven Company is well-known for its engineering and craftsmanship in building ovens to fit the specific needs of manufacturers in the foundry industry.

Naturally, you won't want to miss any *sound* ideas on a better way to process your product. MOCO engineering has many of them. Wouldn't it be wise to investigate?

WRITE TODAY FOR FREE INFORMATION
This MOCO technical literature points the way to many cost saving ideas. Send for it today without obligation.

MICHIGAN OVEN COMPANY

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For More Information Circle 667, Page 39

you get MORE with MOROC®

the controlled silicate CO_2 binder

MORE SPEED. Curing time ranges from ten seconds to three minutes, depending on type of mold or core.

MORE LABOR SAVING. Cores are ready for use when they come from core box. You eliminate movement to and from ovens, handling of core driers, cementing of halves.

MORE FLEXIBILITY. Fast curing means faster handling of rush orders. There's no need to stockpile cores for future orders. You have the flexibility to meet customer needs on schedule.

MORE PROFIT. With MOROC you can get this extra capacity and flexibility with a smaller investment in equipment than would be required for additional ovens or shell-molding equipment.

MOROC COMES IN FOUR GRADES

MOROC 1. High-strength binder.

MOROC 2. High strength and good collapsibility.

MOROC 3. High strength and high collapsibility to meet demands of core-blowing equipment.

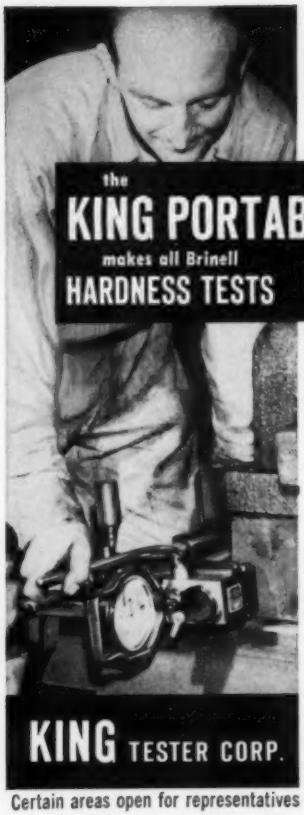
MOROC 4. Extra-high collapsibility and good flowability.

Other Diamond Chemicals for the foundry:
Soda Ash (briquettes & granulars), Caustic Soda, Chlorine, Solvents

Write for complete information. Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio

Diamond Chemicals

For More Information Circle 668, Page 39



any size, shape or thickness . .

the **KING PORTABLE** makes all Brinell **HARDNESS TESTS**

quickly, accurately, ANYWHERE!

Round, flat or unusual shapes or sizes are no problem to test with the King Portable. Rugged—lightweight, it tests metals from softest leads to toughest alloys having over 700 BHN. And it can be used anywhere, accurately!

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KING TESTER CORP.
448 North 13th St.
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Certain areas open for representatives

For More Information Circle 669, Page 39

SCIENTIFIC
PRESSURE CAST
MATCHPLATES

"BUILT WITH *EXTRA* CARE"

Not a single matchplate leaves the Scientific Plant without rigorous 7-point inspection.

Better equipped than ever before, we are continuing to progress and thank our many customers.

THE SCIENTIFIC CAST PRODUCTS CORP.
1390 East 40th Street • Cleveland 3, Ohio

For More Information Circle 670, Page 39

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Aluminum Melting and Holding Furnaces
"Ladle Out" Crucible Type for Die Casting,
Permanent Mold, or Sand Casting

Forty-four years of continuous service to the non-ferrous foundry industry, under the same name and ownership, has earned a "buy with confidence" reputation for HAUSFELD FURNACES.

Write for Bulletin No. 103, today

THE CAMPBELL-HAUSFELD COMPANY
300-D Moore St. Harrison, Ohio

CAMPBELL-HAUSFELD Metal Melting Furnaces

For More Information Circle 671, Page 39

THE PROFITABLE ANSWER . . . . . to rising costs is an effective method and production engineering program

Our professional foundry engineering staff is successfully helping management to increase productivity—increase wages —reduce costs.
We are proud of the results obtained for our foundry clients.
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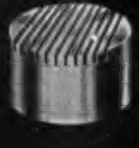
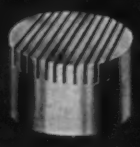
For More Information Circle 672, Page 39

SLOTTED CORE BOX VENTS

X-TRA DEEP HEAD .156 Wide Slots .014



SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

Manufactured by **C. M. SMILLIE & CO.** 1124 WOODWARD HGTS. FERNDALE 20, MICH.

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER
- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

For More Information Circle 673, Page 39

MURPHY PISTOL SPRAYER guaranteed

2922

Forces blackening into pores and pockets of molds. Sprays silica wash, oil, or water equally well. Used also to sand blast, to clean automobile and diesel engines, to spray centrifugal molds. Standard of the foundry field for more than 50 years. Priced from $17.25. Write for quantity discounts.

(Also furnished in a deluxe model with air pressure reducing valve, 20' of air hose, and 5' of suction hose, both of superior quality, oil and acid resisting plastic.)

Ask your foundry supply dealer or —

Write for FREE Data Sheet No. 2922

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For More Information Circle 674, Page 39

CENTRIFUGALLY CAST

CYLINDER LINERS FOR HIGH PRODUCTION

MODEL MLS

ONE MAN OPERATION

METALLURGICALLY CONTROLLED METAL

Pneumatic control system—Measured molten metal—Timed spin—Automatic spraying—Sturdy construction for continuous operation by unskilled labor.

This is only one of many machines designed for high production of better castings, made centrifugally. Technical advice and mold design service available to all customers.

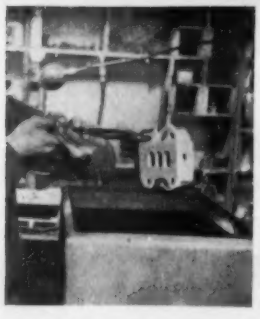
Write for Illustrated Bulletin No. 161

CENTRIFUGAL CASTING MACHINE CO.

P. O. Box 947 **Tulsa 1, Oklahoma**

For More Information Circle 676, Page 39

CORE BOX PROTECTION



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T.M. Reg.

Core Box & Vent Cleaner

SAFE, HARMLESS TO HANDS

TYPE 1: Water-mixed. Use for oil bonded sands.

TYPE 2: Removes baked resins and silicones build-up on shell equipment.

KEEP VENTS CLEAN WITH CORCOSOLV

FREE SAMPLES ON REQUEST

"QUICKINSERT" core box vents • "PROTEXABOX" pins • "SAND ARRESTER" tubes • "HOLINER" bushings • PARTING LINE Sealing Strips

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APPRAISALS . . . WAGE INCENTIVE PLANS . . . COST SYSTEMS . . . EXECUTIVE CONTROL . . METHODS PRODUCTION CONTROL SYSTEMS . . .

PLANT REMODELING . . PLANT DESIGN . . CONTINUOUS SYSTEMS . . . SEMI-CONTINUOUS SYSTEMS . . . PRESENT OPERATION MODERNIZED

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1645 LEE ROAD CLEVELAND 18, OHIO

For More Information Circle 677, Page 39

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"THAT GOOD" FOUNDRY COKE

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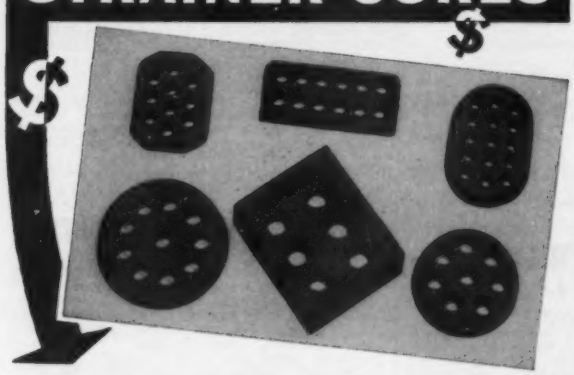
**Reg. U. S. Pat. Off.*

For More Information Circle 675, Page 39

For More Information Circle 678, Page 39

Save Money *with* RUDOW STRAINER CORES



Custom Made • Will Duplicate Your Sample or Drawing • Unlimited Design Range • High Heat Resistance • Extra Hard • Saves Time—Trouble

RUDOW quality Strainer Cores cut rejects, cut costs, keep castings free of oxides, slag and impurities—simplify gating control and metal flow, for greater production. We offer you Free Samples of RUDOW Strainer Cores—made like your sample, or from your drawing. Write today—or phone MAin 6-1163.

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For More Information Circle 679, Page 39

Container pivots 120° to facilitate loading-unloading.

ALMCO *Vibrasheen* FINISHES FASTER!

Constant vibratory motion . . . that's the secret of faster deburring and finishing you now get by using the new ALMCO *Vibrasheen* Method!

This amazing metal finishing machine vibrates a full 5 cu. ft. load* of parts and media . . . uses scrubbing action to remove burrs and finish parts in a fraction of the time required in ordinary barrel finishing operations.

The new *Vibrasheen* Method is particularly suited for faster burr removal from parts, and finishing hard-to-reach internal crevices. Can be used for deburring, descaling, cleaning, burnishing and surface refinement.

For full story on *Vibrasheen* Method and on processing sample parts, write for the new ALMCO Album of New Products!

* *Smaller and larger models also available.*

FREE!
NEW PRODUCT ALBUM
Gives full information on new Almco Supersheen Systems. Describes new and better machines, methods and media. Write today!

ALMCO
QUEEN PRODUCTS DIVISION
King-Seeley Corporation
154 E. Main St.
Albert Lea, Minnesota

For More Information Circle 681, Page 39

IF YOU MUST PREPARE YOUR SAND ON THE FLOOR RINGLIFT CONDITIONER *CAN DO IT BEST!*

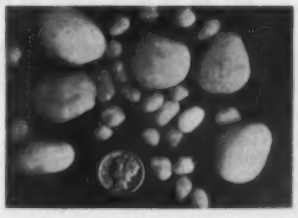
For better than any other conditioner now available. Picks up all sand from floor, screens, cools, aerates and tempers it, magnetically separates metal, moistens sand and returns it to floor in neat windrows. Send for literature.

STATES ENGINEERING CORPORATION
245 E. Murray St.
Fort Wayne, Indiana
SAND PREPARATION • MECHANIZATION • PLANT LAYOUT

For More Information Circle 680, Page 39

HIGH QUALITY SILICA QUARTZITE PEBBLES

HIGH QUALITY • LOW ALUMINA



FINELY GRADED TO DESIRED SIZE

R. W. SIDLEY, INC.
TELEPHONE CY 8-3232
THOMPSON, OHIO

For More Information Circle 682, Page 39

HARTLEY CONTROLS CORPORATION
NEENAH • WISCONSIN
Originators of Fully Automated Sand Systems for Foundries

For More Information Circle 683, Page 39

ALL GRAY IRON FOUNDRIES:

Rig and chemical carbon destroyer to control pollution caused by cupolas. Cost per rig per cupola: $100. Chemical controls ash. You make rig according to our plan. Submit cupola stack dimensions to

BENEDICT CHEMICALS, INC.
213 North Front Street, New Haven, Connecticut

NAME FIRM _____

ADDRESS _____

NAME _____ TITLE _____

For More Information Circle 684, Page 39

CLASSIFIED ADVERTISING

• HELP WANTED

SUPERINTENDENT
SMALL GRAY IRON FOUNDRY NEAR CHICAGO. MUST HAVE EXPERIENCE IN MOLDING AND MELTING OF GRAY IRON AND DUCTILE. MUST HAVE RECOMMENDATIONS. ADDRESS: BOX 841, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

FOUNDRY ENGINEER
Needed immediately, experienced, inventive, Foundry Engineer for nonferrous foundry (Bronze & Aluminum). Sand, permanent and centrifugal molding, core making and cleaning departments. Sand laboratory and powder metal manufacturing. Strong mechanical background necessary. Salary open. Reply by resume in confidence to . . . Address: Box 850, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

HELP WANTED
We are a Midwest ferrous foundry looking for an experienced man to start and develop an aluminum foundry operation. Forward resume with salary requirements.

BOX 827, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY MANAGER
Must have successful experience in the production of malleable, pearlitic and nodular iron castings. Metallurgical or engineering background required; PEF training desirable. Preferred age 35-45.
In return for these requirements we offer an outstanding opportunity with one of the major producers in the country. Location is in the Mid-West. Excellent starting salary and benefits. Send complete details—education, work history, family status, plus a recent photograph. All information will be held in strict confidence.

BOX 832, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• HELP WANTED

FOUNDRY SUPERVISOR

To take charge of coreroom and squeezer operation in Midwestern steel foundry.

Must know sand and be able to maintain good production.

Average number of employees to be supervised about 30.

If interested, send experience, education and qualifications.

BOX 835, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT
With minimum of ten years' supervisory experience. Must have strong malleable background. Engineering degree preferred. Age 35-40. All replies will be held in confidence, and should include complete work history, education and personal data.

BOX 833, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PLANT MANAGER
Medium-heavy mechanized Meehanite iron foundry, Midwest location. 150 employees. Excellent future. State education, experience, salary requirements, etc. Furnish late picture. Write Box 853, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PLANT ENGINEER
To direct all plant engineering functions in large malleable foundry located in the Mid-West. Degree required. Age preference 30-40. Send complete details in confidence.

BOX 834, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• HELP WANTED

FOUNDRY ENGINEER
$8,000 to $10,000
Young Engineer, interested in assured future with rapidly expanding, progressive foundry where competence is rewarded with advancement. Client assumes all expenses. Contact Bill Newell in confidence.

MONARCH PERSONNEL
28 EAST JACKSON BLVD. CHICAGO 4, ILL.

• POSITIONS WANTED

SUPERINTENDENT OR GENERAL FOREMAN
Twenty-five years' supervisory experience in steel foundry jobbing and production. Includes carbon, alloy, and stainless steel—pressure and X-ray castings: Quality control, molding, melting, coremaking, cleaning, heat treating, sand mixtures, gates and risers. Address: Box 852, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ENGINEER
Fourteen years' diversified experience in the field of foundry operation and engineering. Age 37. Interested in a responsible position of foundry engineer, plant engineer or foundry equipment designer. Address: Box 861, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FERROUS, NONFERROUS FOUNDRYMAN
Twenty-six years' practical and technical experience in jobbing and production foundries in Europe and U. S. A. 14 years' supervision and troubleshooting. Age 43. Prefer nonferrous. Resume on request. Address: Box 859, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT
Technically, practically and administratively experienced in producing grey iron, ductile, malleable and steel. Presently employed. Will consider overseas assignment. Address: Box 837, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

POSITION WANTED
Time Study and Methods Engineer. Seventeen years' experience; twelve years in C.I. and D.I. foundry. Do all estimating. Eight years as department head. Now Employed. Desire relocation and chance to advance. Resume on request. Address: Box 830, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER
Practical and technical trained foundryman. 20 years' diversified experience supervising and managing light to extra heavy jobbing and production iron foundries. Castings up to 30 tons. Cost and quality minded. Excellent labor relations. Best of references. Age 47. Now employed. Address: Box 845, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD DESIGNER
Fully experienced in Aluminum and Magnesium mold design and operation. Available in New York City and New England area. Address: Box 836, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR
Experienced molding and core room supervisor in steel and iron (Meehanite). Production or jobbing; knowledge of gating, risering, production control, CO_2 and cold set core making. Complete foundry background. Age 37. Address: Box 856, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING FOREMAN
Twenty years' EXPERIENCE in steel foundry. Floor molding and machine molding: Bumpers or slingers. All types castings to 20 tons. Address: Box 863 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDER
Practical loose pattern molder; floor, bench or pattern match plate. Has J.C.S. Foundryman's diploma. Desires permanent connection as molder with well established growing foundry. Address: G. C. Bradshaw, 701—14th Street, Phenix City, Alabama. Phone CY 8-9182.

PERMANENT MOLD ENGINEER
Experienced in all phases of mold design and operation. Graduate engineer with broad nonferrous background. Address: Box 855, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Practical foundryman, nationally known for a job well done. Age 48. Good health, Now employed. Looking for more action ferrous or nonferrous, $15,000 minimum. Address: Box 857, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR
Twenty-five years in supervision, experienced in gating and sampling, squeeze, cope and drag work. Prefer malleable job shop. Will relocate. Address: Box 864, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER

To Work With Customers in Developing Casting Techniques in Non-Ferrous Metal Alloys.

Must have experience in pattern requirements including methods of gating, risers, venting and coring. Experience in sand preparation, centrifugal and permanent mold pouring and thorough knowledge of degassing, skimming, temperature control and alloying required.

Will work closely with sales personnel.

Position in rapidly growing company provides a bright future for the right man. Salary open.

Please send resume, in confidence, to:
Mr. Herman E. Berstler, Mgr. of Personnel

The Beryllium Corporation
P. O. Box 1462, Reading, Pa.

BERYLCO®

• POSITIONS WANTED

PROFIT—DOMINATED

Hard-driving and versatile foundryman desires demanding position as manager's assistant or superintendent. Fourteen years of diversified gray iron jobbing and production experience. Journeyman. Engineer graduate with added business education. Young familyman. Will go anywhere.

BOX 839, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT

Practical foundryman technically trained, 30 years' experience producing quality jobbing and production. Well versed modern methods: age 60. Salary secondary to good connection. Address: Box 848, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT—GENERAL FOREMAN

Practical and technical; presently employed in the East; over 30 years' experience; jobbing or production to 5 tons. Address: Box 851, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PRACTICAL AND TECHNICAL FOUNDRYMAN

With good profit record would like to make change. Will relocate. Address: Box 847, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

SALESMAN

Foundry equipment and supply salesman wanted by supply house for Illinois and Indiana area. Must have complete knowledge of line. Car furnished. Reply to Address: Box 828, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATIVE WANTED

Aggressive man to represent Eastern Investment Casting house. Prefer man now representing a sand foundry or die casting house or other allied lines, in the New York Metropolitan area. Address: Box 829, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• CONSULTANTS

FOUNDRY CONSULTANT—NONFERROUS

Sand casting—Permanent mold casting—centrifugal castings—in aluminum, brasses, bronzes, 30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, West Palm Beach, Florida. PHONE: TEMPLE 2-8685.

CONSULTANT

In foundry operations and engineering gray iron, malleable iron and steel. Address: HERBERT F. MILLER, 589 Trade Winds Drive, Dunedin, Florida.

• FOUNDRIES WANTED

WANT TO BUY OR LEASE

Well equipped aluminum foundry. We have been in the foundry business for thirty years. Address: Box 865, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY—WANTED—EQUIPMENT

Foundry investment organization needs used equipment to activate and mechanize a large foundry. Complete foundry with or without property will be considered. Please be specific as to price and when inspection can be made. Principals only. All replies confidential.

BOX 840, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY WANTED

GROUP OF FOUNDRY ENGINEERS AND INDEPENDENT MANUFACTURERS WANTS TO PURCHASE FOUNDRIES (FERROUS AND NONFERROUS) WITH OR WITHOUT PROPERTY. PLEASE SUBMIT COMPLETE DETAILS AS TO CAPACITY, TYPE OF PRODUCTION, FOUNDRY EQUIPMENT, FLASK INVENTORY.

PRINCIPALS ONLY
ALL REPLIES CONFIDENTIAL

BOX 843, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

EQUIPMENT WANTED

Large South American Manufacturer wants to purchase complete foundries, without property, for own use. Plants must have large capacities. We are ready to do business as soon as we receive complete details as to price, equipment, inspection, etc. All replies confidential.

BOX 858, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS
Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. FINANCIAL 6-8700
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

• FOUNDRIES FOR SALE

FOR SALE

Pattern Business — wood and metal fully equipped, with real estate. Located in New York Metropolitan area. Address: Box 846, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SMALL GRAY IRON FOUNDRY

Modern equipment, nice home included and other extras. Plenty of land for expansion. Detroit, Michigan area low down payment. Opportunity for experienced foundryman. Address: Box 862 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• WANTED-TO-BUY

WANTED

Shell Molding Machine and Accessories, Shell Core Machine. Address: Box 854, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Used Laboratory Equipment

Send details To

BOX 849, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

CASTINGS WANTED

Manufacturer of very competitive hardware items located in metropolitan New York desires gray iron foundry to cast and machine (tapping inside and outside threads) their work. Speedy delivery important. Address: Box 844, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Reversible Moulders' Friend Sand Conditioner, with 60 or 70 inch spare brush. Address: Box 831, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

FOR SALE

SIMPSON #2 UD Muller
SIMPSON #2 OG Muller
SIMPSON #1½ OG Muller
SIMPSON #1 UD Muller w/loader
SIMPSON #1½ F Muller w/loader
B & P Mulbaro
CLEARFIELD #404 Muller
OSBORN #276 Jolt Squeezers
OSBORN #275 Jolt Squeezers
SPO #110 Jolt Squeezers
SPO #2114 Jolt Squeeze Pin Lift
J & J #918 Jolt Rollover 44" x 54"
J & J #815 Jolt Rollover 30" x 40"
B & P #8, M, L, Screenerators
ROYER 16" Sanditioner
DETROIT 5 Ton Air Hoist w/trolley
I-R 1000-6000 lb. Air Hoists
PANGBORN Dust Collector 1000 cfm
AMERICAN Wheelabrator Tumblast 27"x36"

PEK MACHINERY COMPANY

P.O. 4146 BERGEN ST. STATION

JERSEY CITY, NEW JERSEY

PHONE: HE 2-4262

BUY—SELL—LIQUIDATE

• FOR SALE

FOR SALE

SIMPSON #3U/D W/50 HP Motor, Starter, Dust Hood w/Exhaust Fan, 14' Belt for Prepared Sand—$4600 in new parts included. Completely rebuilt.
HANDY-SANDYS (2) Model HS 7-GT (GOOD)
WHITING #4 CUPOLA (Complete w/Blower and Charger)
PORBECK Mold or Core Oven—Large Car Type, Gas-Fired, Recirculating, etc.
TUMBLAST (American) 48" x 72" Complete w/loader/dust collector/etc. BARGAIN for quick sale.

Other Good Equipment

W. O. McMAHON

P.O. BOX 5799 HOMEWOOD STATION

BIRMINGHAM 9, ALABAMA

PHONES: TREMONT 1-2088 AND 9-6170

FOR SALE
Type 316 Stainless Steel
for melting purposes
100,000 pounds
All new uniform bolts
Hex Head—5/16" dia. x 1½" long
24 threads to inch
15c per pound F.O.B. Brooklyn
subject to prior sale
SABIN METAL CORP.
310 MESEROLE ST. BROOKLYN 6, N. Y.
TELEPHONE: EVERGREEN 1-5000

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

FOR SALE

1 Model 40 P-1 San-Bio-Pulsator Core Blower

1 Type FSAC Cincinnati double end floor grinder. 7½ H.P., 3 phase, 220 volts, 1150 RPM, 18" x 3" x 1½" wheel and 18" mounted disc.

1 Type HGA Cincinnati double end floor grinder. 7½ H.P., 3 phase, 220 volts, 1150 RPM, two 18" x 3" x 1½" wheels.

All equipment in good condition.

EMMAUS FOUNDRY & MACHINE CO., INC.
EMMAUS, PENNSYLVANIA

FOR SALE OR LEASE

1.5 meter ARL spectrographic laboratory complete with densitometer, etc., and ARL XIQ X-Ray Quantometer.

ALLOY METAL PRODUCTS, INC.
BOX 330 DAVENPORT, IOWA

• FOR SALE

FOR SALE

B & P model 6024, 6000# hydraulic rollover draw machine complete and in excellent shape, 24" draw, 64" daylight, straight-in conveyor, 90° rollout conveyor.

B & P Rotomold, four roller conveyor station, pneumatically operated, 18' dia. indexing table, capacity 6000# per station, complete and in excellent condition.

Both may be seen in operation.

BOX 838, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

B & P 66-A SPEEDMULLOR

Excellent condition, includes Preparator, Cooling unit, Skiphoist, Multromatic controls. Purchased new 1955. $12,500.

CORE OVEN—Coleman Transrack, 3 compartment, gas-fired, 750,000 BTU, overhead doors, auto. controls, 9 racks, hydraulic lift truck.

CB-10-AC Champion coreblower, new 1956.
CB-12 Champion coreblower, new 1957.

THE M. HERTENSTEIN CO.
27 W. JENKINS AVE.
COLUMBUS 7, OHIO

G-U-A-R-A-N-T-E-E-D
SAND BLAST EQUIPMENT
SELL BUY TRADE
TERMS AVAILABLE
Designers and Erectors of Specialized Blast Equipment

14' Wheelabrator Table Blast Model 4 with 4-66" Spin Tables like new. 30% off list price
4' Wheelabrator Table Blast $2000.00
48 x 48 Wheelabrator Tumblast 3000.00
42 x 48 Wheelabrator Tumblast 2000.00
36 x 42 Wheelabrator Tumblast 1500.00
27 x 36 Wheelabrator 2750.00
27 x 36 Wheelabrator like new 4000.00
Pangborn GF2 Air bbl 450.00
Pangborn 53 EN-2 Hand Cabinet 325.00
Rumcilin 8 x 8 Room 1000.00
Pressure Tanks, all types ..... $150.00 up
Vapor Blast Cabinets 400.00
Vapor Blast Automatic Table 2500.00
All types and sizes of Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.
$100,000 worth of Wheelabrator and Pangborn Spare Parts Priced 25% to 50% Less List.

DIAMOND SAND BLAST EQUIPMENT CO.
5654 W. Jefferson Ave.
DETROIT 9, MICHIGAN
VI-3-6750

FOR SALE

36" x 42" AMERICAN WHEELABRATOR, Serial No. A68000. Address: WELDON F. STUMP, 4835 Crestridge, Toledo 13, Ohio.

• FOR SALE

ELECTRIC ARC FURNACE

Lectromelt "More Rapid" Electric Arc Furnace, 2 ton capacity. Top charge. Swing hood. With transformers and controls. Late model. Or will lease furnace and property.

MELTING CORP. OF AMERICA
OSTEND & RIDGELY STS. BALTIMORE, MD.
LEXINGTON 9-1980

FOR SALE

2 Chamber Lindberg Tilting Induction Melting Furnaces Type 1M-1251-T Mfg. in 1954.

BALCHER MACHINERY COMPANY
5715 EUCLID AVENUE, CLEVELAND 3, OHIO
TELEPHONE: ENDICOTT 1-0420

FOR SALE

Shell Core Machine—MCM—7 Shalco. 1 yr. old.
3 Tumbling Mills 36" x 72"
Cupola Blower 15 H.P.
Cupola Blower 20 H.P.
Wheelabrator Baghouse. Nearly New.

ANAHEIM FOUNDRY COMPANY
125 W. COMMERCIAL ST.
ANAHEIM, CALIFORNIA
PHONE: LAMBERT 6-5566

FOR SALE

JACKSON & CHURCH AUTOCLAVE
Vacuum Impregnator—Jacketed
54" x 72"—150,000 Cu. Inch.
Like New

GLOBE TRADING COMPANY
1815 FRANKLIN STREET
DETROIT 7, MICHIGAN

FOR SALE

1—15 H.P. Ingersoll-Rand Compressor w/motor & tank.
1—10 H.P. Water cooled comp. good condition.
1—Model "L" Screenerator
1—Model "M" Screenerator
1—DeWalt Radial Cut-off Grinder or Saw
3—175,000 B.T.U. Gas Space Heaters

RICHMOND FOUNDRY COMPANY
RICHMOND, ILLINOIS

EQUIPMENT FOR SALE

1 International Core Blowing Machine B.S. 11—Condition excellent.

1 Model AA Wheelabrator Sand Cutter 108" Wide, 73" Diameter cutting cylinder—Condition Unused.

DEMPSTER MILL MFG. COMPANY
BEATRICE, NEBRASKA

FOR SALE

One Used #3 Unit Drive Simpson Muller. Good condition. Address: Box 842, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

C. GREENE EQUIPMENT CORP.
GOOD USED
FOUNDRY EQUIPMENT

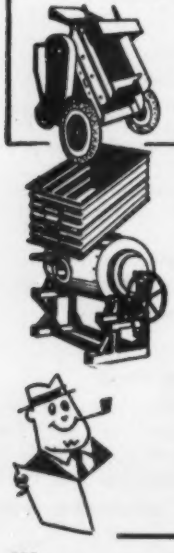
SWING GRINDERS—Used-Excellent condition FOX 10 hp. 3/60/220/440 Volt takes up to 18" x 2" wheel $650.00
MARSCHKE 15 hp. 220-440 V. takes up to 24" wheel $750.00 each

SPO Model 9546 Jolt, squeeze, rollover draw
Simpson No. 1 UD Muller
Simpson No. 1½ UD Muller
Simpson No. 3 Enclosed gear Muller
Simpson No. 1 Open gear Muller
J & J Model 918 Rollover
International Model 30x8 Rollovers
International Model 24x10 Rollovers
International Jolt pin lifts all sizes
J & J Model 8128 Jolt pin Lifts Table 30x38
SPO Rollover pattern draw Model RD 6815 table 36 x 68 draw 15"
International plain jolt machines all sizes
International core blowers all sizes
Champion core blower Model CB 10
International hand operated pin push ups
Pangborn Table cleaning machine Model LG6 with 6' table and 24" aux. tables complete with Dust Collector
Ingersol-Rand 100 hp Air Compressor
Air Compressors 25 hp.
Whiting coal pulverizer Model 30 complete
Whiting coal pulverzier Model 30A complete
Dust Collectors many sizes
Fisher Aluminum Melting Furnaces 1000 lb cap.
Fisher Aluminum Melting furnace 300 lb. cap. motorized nose pour gas fired
Bondactor Model 1000L
Tessmer sprue cutters
Hough Payloaders Model HA ½ yard
Tractomotive payloader ¾ yd. cap.
Air hoists 1000 lb. to 4000 lb.
Ladles all sizes
Steel flasks all sizes
Core ovens all sizes
Beardsley & Piper Tractor type slinger

Many More Items Available

WE SOLICIT YOUR INQUIRIES
WE BUY WE SELL WE TRADE

C. GREENE EQUIPMENT CORP.
4014 W. 24th St.
CHICAGO 23, ILLINOIS
LAFAYETTE 1-1322



EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD CLEVELAND 10, OHIO

CLEANING EQUIPMENT
1—72" Swingout table
3—6 cu. ft. Continuous Tumblast
1—42" x 48", 17½ cu. ft. Tumblast with loader
1—36" x 42", 11½ cu. ft. Tumblast
1—6' Table Airblast w/six aux. tables
1—5' Table Airblast w/six aux. tables
1—6' Table Pangborn LE
2—EN2 Pangborn Cabinets

AUTOMATIC MOLDING MACHINES
2—TDA-4 Taccone 24" x 24"
1—2192-R1 SPO, 21" Squeeze cyl.

ELECTRIC FURNACES
1—3000 lb. Heroult Side Charge
1—500 lb. Lectromelt

MULLERS
Simpsons # 1, 1½, 2, 3, unit drive
Simpsons 2 Portomullers
Clearfield #404, 610

LADLES-WHITING
4—25 Tons 2—15 Tons 2—10 Tons
3—3 ton Bottom Pour
3—3 ton T-Pot

CORE OVEN
1—Di-Electric Model M800-A Thermonic, 30 KW

SANDSLINGERS
1—B-P 19" head stationary, double belt
1—B-P 19" stationary, riddle type

ASK FOR OUR COMPLETE LISTING—CALL GLENVILLE 1-1222

DEPENDABLE SERVICE
QUALITY EQUIPMENT
GUARANTEED SAVINGS

PARTIAL LISTING OF EQUIPMENT NOW AVAILABLE — INQUIRIES INVITED

CUPOLA BLOWERS

MODEL	C F M	PRESSURE	HP
INGERSOLL RAND			
FS-337	3000	20 oz.	25
FS-365	4500	16 oz.	30
FS-355	6000	16 oz.	40
FS-387	10,200	20 oz.	75
FS-377	10,500	20 oz.	85
FS-565	14,100	40 oz.	200
ROOTS CONNERSVILLE			
RCR	1040	20 oz.	10
RCS	9075	32 oz.	100
SPENCER TURBO			
2025H	1850	32 oz.	25
Cont.	7500	48 oz.	150

PANGBORN LK-6' Dia Table-Room Rotoblast, Max. height of work 36", max. weight on table 5000 #. Table speed 2.4 RPM. Pitless type. New 1952. Serial #6LK-5110.

SAND MULLERS

MODEL	PAN. DIA.	CAPACITY
CLEARFIELD		
404	4'	400 #
610	6'	1500 #

MODEL	CAPACITY	AIR COOLED
BEARDSLEY & PIPER		
30	4 cu. ft.	Yes
30	4 cu. ft.	No
60	12 cu. ft.	Yes
60	12 cu. ft.	No
70	15 cu. ft.	No
80	20 cu. ft.	Yes

ALL CAN BE EQUIPPED WITH DUST HOODS, SKIP HOIST LOADERS, MULTRAMATIC CONTROLS, ETC.

MODEL	PAN. DIA.	CAPACITY	DRIVE
SIMPSON			
0	3'	175 #	Sep.
1½	4'-6"	700 #	UD
2	6'	1500 #	UD
2	6'	1500 #	Encld.
3	8'	3000 #	UD
3	8'	3000 #	Encld.
3½	9'-3"	5000 #	UD

ALL CAN BE EQUIPPED WITH NATL. ENG. STRAIGHT LIFT SKIP HOIST BUCKET LOADERS.

MODEL	PAN.DIA.	CAPACITY
LANCASTER		
EA4	59"	9 cu. ft.
EBG-4	59"	9 cu. ft.

JOLT SQUEEZE PIN LIFT MACHINES

MODEL	TABLE SIZE	DRAW	DIA.	CAP.
PKL-12	18" x 24"	5½"	12"	600 #
PKL-14	20" x 28"	5½"	14"	1000 #
PK-16	20" x 30"	5"	16"	1700 #
MILWAUKEE				
125	21" x 27"	8"	12"	1200 #
145	24" x 30"	8"	14"	1700 #
195	28" x 39"	10"	19"	3000 #
196	16¾" x 39"	10"	19"	3000 #
244	22" x 32"	12"	24"	3000 #
245	35¼" x 42"	12"	24"	5900 #
246	23¼" x 42"	12"	24"	5900 #
OSBORN				
710-PJ	16" x 25"	6"	10"	500 #
712-PJ	18" x 28"	6"	12"	750 #
714-PJ	20" x 31"	7"	14"	1000 #
716-PJ	22" x 34"	7"	16"	1250 #
SPO				
2114-P	20" x 27"	4"	11"	600 #
2136	21" x 30"	6"	13"	800 #
2146	23" x 31"	6"	14"	1000 #

JOLT SQUEEZE ROLLOVER DRAW

MODEL	TABLE SIZE	DRAW	CYL.	CAP.
MILWAUKEE				
167	32" x 33"	12"	16"	1000 #
OSBORN				
332	26" x 36"	9"	16"	750 #
333	32" x 45"	11"	19"	1400 #
SPO				
413-C	24" x 25"	10"	13"	600 #
917-A	26" x 36"	9"	17"	750 #

S P E C I A L !

EXCEPTIONAL PURCHASE • INGERSOLL-RAND AIR HOISTS FROM LEADING GOV'T. INSTALLATION • SAVE MORE THAN 50%

QUAN.	MODEL NO.	CAP.	PRICE
6	A	500 #	259.50
5	B	1000 #	279.50
17	C	2000 #	439.50
21	D	4000 #	539.50
13	D-6	6000 #	739.50
7	E	10,000 #	939.50

All equipped with top hooks for hanging; A-430 Trollies and Air Trollies, A Rail at slightly added total cost.

Discounts if purchased in quantity.

WHITING 10-TON HYDBO-ARC FURNACE

10' dia. shell, 6'-8" inside depth, 1" steel plate. Cradle tilt, manual & motorized, 9" dia. electrodes. Capacity—18 to 23 tons cupola malleable iron per hour. Holding capacity—16 tons normal, max. 21 tons.

1—ALLIS CHALMERS 2000 KVA Furnace Transformer. 12,000 volt primary, OIWC motor operated tap changer. Entire unit new 1952.

OSCILLATING CONVEYORS

MODEL	SIZE	CAPACITY in T P H
AJAX ENGINEERING (Lo-Veyor)		
LC 18-6-24	18" W x 24' L	50
LC 24-6-7	24" W x 7' L	70
LC 24-6-21 FA	24" W x 21' L	70
LC 36-6-9DA	36" W x 9' L	100
LC 36-6-14 DA	36" W x 14' L	100
HEWITT-ROBINS		
VC-6	24" W x 120' L	55
VF-3	30" W x 5' L	12
LINK-BELT		
Flexmount	8" W x 70' L	15
SIMPLICITY ENGINEERING		
OA-10-JA	24" W x 13' L	150
OA-10-JA	24" W x 11' L	150
OA-10-JA-2	30" W x 7' L	150
OA-10-JA	30" W x 13' L	100
OA-10-JA	36" W x 6' L	150
OA-10-A	36" W x 10' L	200
OA-10-A	36" W x 16' L	200
OA-10-A	36" W x 25' L	600

SANDSLINGERS

B&P Stationary, Model "DB," 5' jib arm, 4' ram, 19" head, 5" cup, 2-speed, 20/13 HP. Raising & lowering arms or fixed.

B&P Stationary, Model "DB," 8' jib arm, 4' ram, 19" head, 4" tip, 20/16 HP. Raising & lowering arms or fixed.

B&P "Motive Jr.," 11' jib arm, 4' ram, 16" head, 4" cup, R & L arms. 2-speed, 20/13 HP.

B&P "Motive," 15' jib arm, 9' ram, 2-speed, 25/16 HP. With Raising & Lowering

HANDY SANDYS

NEWAYGO SHS-4-G Super Handy Sandys, Single Hopper, 15 cu. ft. capacity, 4' receiving hopper, air gates, 21' center elevator.

NEWAYGO SHS4-GT Super Handy Sandy, Twin Hopper, 25 cu. ft. capacity, 4' receiving hopper, 21' center elevator.

NATIONAL ENGINEERING Moulders Helper, Twin Hopper, 3000 # capacity, each air operated gates.

JOLT PIN LIFT MACHINES

MODEL	TABLE SIZE	DRAW	CAP.
DAVENPORT			
34 A-JS	36" x 46"	12"	2500 #
INTERNATIONAL			
JDP 1200x8	24" x 26"	8"	1200 #
JDP 3000x10	48" x 48"	10"	3000 #
JL	32" x 52"	12"	2000 #
JOHNSTON & JENNINGS			
68-SP	25" x 30"	8"	600 #
812-S	30" x 38"	12"	1600 #
MILWAUKEE			
1030	28" x 34"	8"	1000 #
1536	32" x 38"	10"	1500 #
2036	32" x 38"	10"	2000 #
2542	38" x 42"	12"	3000 #
3548-6	44" x 46"	12"	3500 #
OSBORN			
540	32" x 52"	12"	2000 #
560	32" x 45"	12"	2500 #
SPO			
3070	26" x 35"	10"	1500 #

JOLT ROLLOVER PATTERN DRAW

MODEL	TABLE SIZE	DRAW	CAP.
DAVENPORT			
24 SA	24" x 38"	12"	1000 #
28 SA	28" x 40"	12"	1500 #
34 A	34" x 58"	15"	2500 #
48 A	48" x 82"	24"	6000 #
INTERNATIONAL			
AN	40" x open	20"	4500 #
JOHNSTON & JENNINGS			
612	24" x 30"	12"	600 #
815	30" x 40"	15"	1200 #
918	44" x 54"	20"	2000 #
920-RC	44" x 54"	20"	2000 #
1020-RC	50" x 60"	20"	3000 #
OSBORN			
242-W	29" x 42"	12" to 19"	1500 #
244	35" x 52"	16" to 25"	3000 #
405	57" x 64"	26"	3000 #
442	21" x 31"	10"	600 #
601	24" x 30"	10"	900 #
602	30" x 36"	12"	1200 #
643	35" x 50"	20"	2000 #
SPO			
505	18" x 23"	6¼"	400 #
506	24" x 25"	10"	600 #

MODEL	TABLE SIZE	DRAW	CAP.
TABOR			
22"	22" x 32"	10"	600 #
22"	22" x 42"	10"	600 #
30"	30" x 40"	12"	1000 #
40"	40" x 60"	15"	3000 #

a MACHINERY AND EQUIPMENT COMPANY

"Built on a Foundation of Mutual Trust"

10900 CEDAR ROAD • CLEVELAND 6, OHIO • SW 1-3900

Universal* MACHINERY AND EQUIPMENT CO.

. . . large enough to serve you, small enough to know you.

1632 North Ninth Street
Reading, Pa., Franklin 3-5103

• AIR COMPRESSORS
25 hp INGERSOLL-RAND water cooled, horizontal
75 hp INGERSOLL-RAND water cooled, horizontal
100 hp WORTHINGTON air cooled, 2 stage

• BLOWERS
CENTRIFUGAL 5 Hp to 30 Hp
GE, WILBRAHAM—GREEN FISHER Positive Pressure & Cent., Cupola Blowers

• BLAST CLEANING EQUIPMENT

Over 80 rebuilt Wheelabrator units sold in less than two years.

15" Cont. WHEELABRATOR Tumblast
26" Cont. WHEELABRATOR Tumblast
15" x 20" WHEELABRATOR Tumblast
20" x 27" WHEELABRATOR Tumblast
27" x 36" WHEELABRATOR Tumblast
36" x 42" WHEELABRATOR Tumblast
48" x 42" WHEELABRATOR Tumblast
48" x 48" WHEELABRATOR Tumblast
48" x 72" WHEELABRATOR Tumblast
1-A WHEELABRATOR Multi-table
72" WHEELABRATOR Swing Table
No. 2 WHEELABRATOR Multi-table
WHEELABRATOR Pipe Cleaning Cabinet
WHEELABRATOR Sheet Cleaning Cabinet, handles up to 48" wide stock
PANGBORN 8' LF Table
PANGBORN Air Blast Room 6' x 8'
6' LK PANGBORN Table Room
6' LG PANGBORN Table
DUST COLLECTORS AND SKIP LOADERS AVAILABLE FOR ALL MACHINES

• CONVEYORS
CARRIER Oscillating, 18" W x 54' L
HEWITT-ROBINS Oscill. 18" W x 40' L
HEWITT-ROBINS Vibrating, 18" W x 10' L Model VC-1
LINK-BELT, Car type mold, 114 cars, 403' track, car size 18" x 42"
LINK-BELT Oscillating, 18" W x 13' L
SIMPLICITY 17" W x 11' L, Model OA-10-KA Feeder
SIMPLICITY 24" x 10' Feeder w/hopper, Model OA-10-JA2
Roller Conveyor—Ask for List

• CORE BLOWERS
DEMMLER #1, #2, #2A, #3K
INTERNATIONAL SB-13
OSBORN #91, #192, #91-10
RANDALL MODEL "A" Bench Type
SAN-BLO #40-P-1, 40# core
TACCONE #4D, 10" Draw Stroke Cyl.

• DUST COLLECTORS
COMPLETE STOCK both Bag & Wet Types, 1000 to 17000 CFM

• FURNACES
DIRECT ARC MELTING
250 lb. LECTROMELT, Side Charge
500 lb. LECTROMELT, 200 KVA trans.
1000 lb. SWINDELL
2000 lb. HEROULT
2000 lb. Swindell, 3/60 1000 KVA
1½ Ton HEROULT
11' Top Charge Furnace
INDIRECT ARC MELTING
10# DETROIT
350# DETROIT LFA
750# DETROIT LFY, Conical Shell
1000# DETROIT AA
3000# DETROIT C, 500 KVA
INDUCTION MELTING & HEATING
30 KW, ECCO Hi-freq. Vacuum Melting
30 KW, LEPEL, water cooled spark gap
35 KVA, AJAX Spark Gap, High Freq. steel
50 KW to 200 KW TOCCO Units
GAS & OIL FIRED
400# & 600# FISHERS, MNP
1000# HAUSFELD Hand Tilt, Oil fired, alum or magnesium
1—#900 JC STROMAN, gas, Like new
6000# STROMAN, gas fired
20 Gas & Oil Fired Furnaces
HEAT TREATING
4' x 4' x 10' Gas Fired Annealing
9' x 12' Car Type, gas/oil
210 KW LINDBERG conveyor box type
7' Rotary G.E. 200 K.W. 1950° F
36" x 36" West. Pit Type Electric
10" x 12" x 24" LINDBERG, 2500° F. Hyd
42" x 73' G.E. Roller Hearth, 1950° F.
36 x 96, 48 x 120, 48 x 144 gas fired
Large Stock Gas Fired Box Heat Treating Furnaces

• PIT TYPE ANNEALING
42 x 96, 42 x 120 recirculating gas fired

• GRINDERS
DOUBLE END
3 Hp HISEY WOLF 3/60/220
5 Hp U.S. Model 64, 3/60/220
7½ Hp U.S. Model 66, 3/60/440
10 Hp STANDARD 3/60/440
15 Hp MARSCHKE 220 volt
25 Hp KLING 3" dia. shaft
SWING FRAME
7½ Hp MUMMERT-DIXON 2/60/220-440
10 Hp SAFETY 24" x 3" wheel
15 Hp MARSCHKE 3/60/220-440
15 Hp MUMMERT-DIXON

• LADLES
BOTTOM POUR
MODERN, 49" x 49"
MODERN Crane Type, 55" H x 50" top
MODERN Crane Type, 60" H x 60" top
LIP POUR
WHITING 52" x 52" top dia. geared
CYLINDRICAL
WHITING, 26" L x 25" dia, 1100# iron
WHITING, 19" L x 22" dia, 600# iron
WHITING, 38" L x 28" dia, 2200# iron

• MATERIALS HANDLING
BYERS Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

• MOLDING MACHINES
JOLT ROLLOVER PATTERN DRAW
DAVENPORT #408A, 40" x 60" table, 3000#
HERMAN 10,000# 48" x 109" table
HERMAN 6000#, 42" x 78"
HERMAN 7500#, 40" x 50" table
HERMAN 3000#, 30" x 66" table
HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
HERMAN 1500#, 36" x 48" table
INTERNATIONAL 27" x 16", Type F, 22" x 64" table
INTERNATIONAL 31" x 18", Type F, 28" x 78" table
INTERNATIONAL 30" x 12", Type G, 28" x 35" table
INTERNATIONAL 13" x 17" table
INTERNATIONAL 43" x 16", type F, 42" x 72" table
OSBORN #243-W, 35" x 40"
OSBORN #602, 36" x 26", 900#
OSBORN #405, 3000#, flask 64" x 57"
TABOR 40" x 60", 1500 & 3000#
TABOR 22" x 42" pattern draw shockless, portable 600#
TABOR 20" x 30", w/air clamps, 1000#
TABOR 14" x 16" Rockover 150#
TABOR 40" x 50" table 3000# capacity
PLAIN JOLT
INTERNATIONAL, 3' x 4' Table, 12" cylinder
TABOR 3' x 4' table
JOLT PIN LIFT
HERMAN #1317, 22" x 30" table
SPO #305, 750 lb. 20" x 27" table
TABOR 20" x 24" table, 600#
JOLT SQUEEZE PIN LIFT
INTERNATIONAL PKL, 20" x 28" table, 14" sq. 5½" draw
INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5¼" draw, stat.
MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
MILWAUKEE #165, 24" x 30" table, 16" sq., 1700#
NICHOLLS 18-44, 6½" draw
OSBORN, #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
OSBORN #716 PJ, 22" x 34" table 16" sq., 8" draw
SPO #2114P, 21" x 27" table, 600#
SPO #2116, 21" x 27" table, 11" sq., 6" draw
JOLT SQUEEZERS
INTERNATIONAL #12 LJS, 16" x 20"
OSBORN #275J, 16" x 20" table, 400#
SPO #110J, 17" x 20" table, 400#
SPO 113PJ, 18½" x 26" table
TABOR Squeeze-In Head, 16" x 19" table
TABOR Yoke Type, 18" x 26" table

• MULLERS AND MIXERS
B&P #30 Speedmuller w/skip, 3 cu. ft.
B&P #40 Speedmuller w/skip, 5 cu. ft.
B&P Conventional, SIMPSON type, 87½" Dia., arranged for cooling
B & P #70 Speedmuller, 15 cu. ft. w/cooling.
CLEARFIELD #920, 9' dia., 30 cu. ft.
CLEARFIELD #610, 6' dia., 14 cu. ft.
SIMPSON, #0, U.D., 3' Dia.
SIMPSON #1, U.D., 4' dia., 4 cu. ft.
SIMPSON #1, Sep. Dr., 4' dia., 4 cu. ft.
SIMPSON, #1½, U.D., 4'6" dia., 6 cu. ft.
SIMPSON #1½, Sep. Dr., 4'6" dia., 6 cu. ft.
SIMPSON #2, enc. gear or open gear, 6' dia. 14 cu. ft.
SIMPSON #3, 8' Dia. Sep. Dr., 30 cu. ft.
WHIRLMIX, 31" dia., 200 to 300 lb. sand

• OVENS
COLEMAN, Gas, 2 Comp. and 5 drawers. O.D. 22' x 12' x 10'
GIRDLER Thermex Dielectric Core Oven, 15KW w/36" W mesh belt
THERMONIC Dielectric Core Oven, 18 KW, w/40" wide mesh belt

• PRESSES
40 Ton FERRACUTE Sprue Cutter 1½" stroke
125 ton R.D. WOOD Down acting, 9" stroke
NIAGARA No. 82 Punch Press

• SAND CONDITIONING
B&P Nite-Gang
B&P Screenarator, Model "M"
LINK-BELT Revivifier
ROYER, NC-2, 10-15 tons/hr, 1½ Hp
ROYER PREPARATOR, Comb., Model NDC, 25 ton/hr scrap removal 8' x 8' hopper
ROYER, NDP, 15-25 tons/hr, 2 Hp
ROYER, "NRP," 40-60 tons/hr, 5 Hp.

• SAND SLINGERS
B&P Stationary, Single Speed
B&P Tractor Type 16" Head
B&P Tractor Type 19" Head
B & P Motive Speed slinger, 2 speed, 22" head, 5" tip

• SHAKEOUTS
2' x 10' HEWITT-ROBINS
3' x 10' SIMPLICITY
4' x 5' SIMPLICITY
4' x 6' SIMPLICITY
4' x 8' SIMPLICITY
5' x 6' HEWITT-ROBINS
5' x 8' HEWITT-ROBINS

• TESTING MACHINES
3000 Kg Gogan Brinell Testers
24,000 lb Tensile Tester
60,000 lb. Tensile Tester

• TRANSFORMERS (Furnace)
100 KVA KUHLMAN 13,200, 1/60
250 KVA WESTINGHOUSE 6600, 3/60
300 KVA WAGNER 4600, 1/60
500 KVA KUHLMAN 13,200, 1/60
800 KVA PENNA, 23,000, 3/60
1000 KVA WESTINGHOUSE 23,000, 3/60
1000 KVA G.E. 13,200, 3/60
2000 KVA WESTINGHOUSE 13,200, 3/60
5000 KVA WESTINGHOUSE 2300, 3/60
7500 KVA PENNA, 13,200, 3/60

• TUMBLING BARRELS
SLY 68" x 32" round
SLY 48" x 36" round

• MISCELLANEOUS
BLASTCRETE Model PM-1 Cupola Gun
FLASKS, CORE PLATES, All Sizes
CLIMAX Model 2-A Wire Straightener
62" Magnet
MOULDER'S Hoppers, Various Sizes
TABOR 10 HP Cut-off Saw

TOCCO SALE — INDUCTION HEATING UNITS

2—50 KW TOCCO 9600 cycle, 100 Hp motor
3—50 KW TOCCO JR. 2 station, 9600 cycle, 90 Hp motor
2—80 KW TOCCO JR. 2 station, 9600 cycle, 140 Hp motor
4—100 KW TOCCO JR. 2 station, 9600 cycle, 175 Hp motor
2—200 KW TOCCO JR. 1 station, 3000 cycle, 310 Hp motor

* Your *DEPENDABLE* Foundry Equipment Dealer

THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

BLOWERS
I.-R. 12900 cfm, 100 h.p. 220-440 V, 20 oz.
GE 10500 cfm., 20 oz., 85 h.p., 220 V.
GE 7500 cfm., 20 oz., 89.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
6000 cfm. INGERSOLL-RAND 32 oz.
SPENCER 3500 cfm., 20 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm., 32 oz.
NORTH AMERICAN 1050 cfm, 16 oz.
NORTH AMERICAN 850 cfm.
500 cfm NORTH AMERICAN 12 oz.
McKee 200 cfm

BUCKET ELEVATOR
33' Newaygo 12" x 7" Buckets
28' Newaygo 12" x 7" Buckets

CLEANING EQUIPMENT
27" x 36" American w/skip
48" x 72" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
AMERICAN #2 Tablast 8-28" tables, late
PANGBORN GD1-Airblast Barrel

CONVEYOR
17' BARBER GREEN Bucket Conveyor

CONVEYORS, OSCILLATING
24" x 40' Ajax
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11' Ajax
8" x 13' Ajax

CORE BLOWERS
CB15 55# cores, Universal blow plate
DEMMLER #50
1—DEMMLER #55 w/vibratory hopper
2—DEMMLER #55 w/plain hopper
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD #2 & #4

CORE GRINDERS
1—MILWAUKEE 70-9 S/N 12671

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET. Drawer Type

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
2—WHITING 10 Ton cap. 107'3½" span, OETC Outdoor type
1—WHITING 3 Ton OETC Cupola Charge Crane, 20' span

CUPOLA GUNS
1—Bondactor #1250 and 1000

CUTOFF SAWS
UNUSED DEWALT CUTOFF SAWS for ferrous or nonferrous metals, cutoff or as sprue cutters. Flush blade adapter takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & Sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting of large work. Motor swivels horizontal to vertical in yoke.

DUST COLLECTORS
PARSONS 40,000 cfm, cloth bag type

ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
400# Fisher Motorized Tilt, Gas Fired
600# Fisher Stationary
600# Campbell Hausfeld Brass

GRINDERS, MISC.
U.S. #70 Comb. 20" disc & 20"x3"x1½" wh
GARDNER 18" single end disc.
GARDNER 26" D.E. Disc
Porter Cable BG 8 8" belt
72" Gardner Horizontal Disc
53" Hanchett Horizontal Disc

GRINDERS, SNAG
US #64 D.E. 20" x 3" x 10"
#5 Fox Sgl. Wh. 24" snag.
2—KLING H.D. 24" x 3" x 12" D.E.
KLING H.D. 20" x 2" x 7" D.E.
5—#6 FOX Single Wheel 24" Snag
U.S. #65 D.E. 30" x 3" x 12"

GRINDERS, SWING FRAME
FOX 24" x 3" x 12", 15 h.p.
MARSCHKE 24" x 3" x 12" 20 h.p., 220 V.
U. S. 24" x 3" x 12" 15 h.p., 220-440 V.
2—MARSCHKE 3 p.h., 12" wheel
1—B&D 7½ h.p.

HEAT TREATING FURNACES
G. E. Elevator Type 1950° Atmosphere Generator 65" x 16' car. Electric. Late
G. E. Elevator type 2150°—96" x 144" car atmosphere generator. Electric. Late
LINDBERG 1250° 48 x 60 Electric
3—ABBOTT 24" H x 22" Deep x 30" Wide, Gas Fired
HOLDEN #202 1850° Bright Hardening Annealing
25 KW Westinghouse 2000°

HOISTS
6000# Cleveland, w/monotractor travel
6000# Electrolift
6000# INGERSOLL-RAND Air w/powered trolley
4—2000# R & M
4—CLEVELAND 2000# Cab type hot metal carriers
1—500# Ingersoll-Rand LC-4

INDUCTION MELTING EQUIPMENT
30 KW Lepel Spark Gap
35 KW Ajax Tama Wyatt, 60 cycle induction holding furnace
1000# Ajax Spare Melting Furnaces

LADLES
WHITING 16000# Crane
WHITING 8000# Crane
WHITING 5000# Crane
4000# Industrial Holding

MOLD BLOWER
TACONNE TD4 24" x 32" flask

MOLD CONVEYOR
366'—51—44" x 66" cars

MOLDING MACHINES
TACCONE High Speed molding machine for production pipe molds

JOLT SQUEEZE PIN LIFT
5—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff—rolling molding machines 10" jolt cylinder; 1800# capacity, 26" squeeze cylinder; 12" draw. Flask size 25¼" to 29" wide, 52" long. FACTORY REBUILT.
2—MILWAUKEE 165, 24" x 30", 8" draw
MILWAUKEE No. 145-2, 27" x 30" table

JOLT SQUEEZERS
2—CHAMPION JS10P 18" x 21" table
1—OSBORN 275PJ
3—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table
276 SPO
4—113 PJ SPO
25—124 Milwaukee Portable Jolt Sq.
6—104 Milwaukee Portable Jolt Sq.
MILWAUKEE #162—1, 900 lbs cap.

JOLT ROLLOVER DRAWS
HERMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
1—SPO 9032
3—SPO 506
1—SPO 506 SP
DAVENPORT #24—SA
2—INTERNATIONAL G
1—TABOR 30 x 52

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES.

PLAIN JOLT
36" x 60" Herman

MULLERS and MIXERS
2—#2 Simpson UD
#40 B & P w/skip and water meter
#60 B&P w/spare parts, mtr. & starter
1—#3 UD Simpson
1—930 Clearfield
CLEARFIELD #404
1—#2 SIMPSON OG
CLEARFIELD #610
CLEARFIELD—Laboratory

SAND CONDITIONERS
AMERICAN 51"
ROYER NDC—ND2
SCREENARATORS S-M-L

SAND SLINGERS & EQUIPMENT
3—19"—2 speed Stationary
2—14' Turntables
1—12' Turntable
4—7' Plate Feeders, 35 & 45 Tons

SAND SYSTEM EQUIPMENT
33' Newaygo Bucket Elevator 12" x 7"
28' Newaygo Bucket Elevator 12" x 7"
4—7' B&P Plate Feeders, 35 & 45 Tons
2—18" x 52' Magnetic Belt

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic

SHAKEOUTS
6' x 10' SIMPLICITY, Som—11, Spring Mounted

3' x 10' SIMPLICITY
5 x 10 LINK-BELT
4 x 8 LINK-BELT
2' x 8' Double Deck

SHELL EQUIPMENT
SHELL PROCESS 20" x 30" pattern size w/shell blender and bonding press

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SPRUE CUTTERS
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OBERMAYER 2 H.P.

STRAIGHTENING PRESS HYDRAULIC
225 ton Southwark
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100 tons Hannifin Hydraulic
60 ton Lempco 4 post
60 ton Farquhar "C" Frame
25 ton Fox
25 ton Dennison

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V

TUMBLING BARRELS
ROTO-FINISH Model DW 45-36
SLY, 24" x 48"; 3 H.P.
SLY, 30" x 60" Duplex

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(2) 27" x 36" Rubber Belt C/W Dust Collector & S/H
(1) 27" x 36" Steel Flight C/W Dust Collector & S/H
(2) 36" x 42" Steel Flight C/W Dust Collector & S/H
(1) 48" x 72" Steel Flight C/W Dust Collector & S/H
(1) 1-A-Multi Tables W/8-19" Tables C/W/D/C
(1) Wheelabrator Skip Hoist—For 27" x 36" (Never Used)
(1) Hollingsworth 5 cu. ft.

SAND MULLERS

(1) Clearfield #404 4' 400# Cap.
(1) Clearfield #610 6' 1500# Cap.
(1) Simpson—1—C—C/W/Skip Hoist. 4' 500# Cap.
(1) Simpson—#3 UD—8' 3000# Cap.
(1) Nat'l Engineering Skip Loader for —Simpson Muller

MOLDING MACHINES

(2) Milwaukee—125 3A Jolt Squeeze Pin Lift Table 21" x 27"—8" Draw Cap. 1200#
(2) Osborn 7012 Jolt Squeeze Pin Lift 21¼" x 24" Table—6" Draw Cap. 750#
(6) Tabor — #210-Jolt Top Squeeze Table 16" x 19"
(6) Osborn 275J Jolt Squeeze Table 16" x 19"
(1) Davenport JS-10—Cap-3000# Table 42" x 48"
(2) Osborn 75-J Jolt Squeezers Table 16" x 20"
(1) Johnson & Jennings #612-CP Jolt Squeeze Table 18" x 22"
(1) Tabor Plain Jolt 72" x 72" Cap. 8,500#

CORE BLOWERS

(1) Demmler #55—Ser. 2032 C/W Air Clamps
(3) Redford #2

MISC. FDRY. EQUIPMENT

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(1) Stroman—Rev. Furnace—1957—Gas Fired C/W-Controls 600# Aluminum — 1800# Brass — Automatic Tilt
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Tabor Top Squeeze 10"
SPO 110J—113J
Champion 10"
Milwaukee 104-5—10"—12"
SPO 2136

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Milwaukee 145 24 x 30 Table 8" Draw
Osborn 712 18 x 28 Table 6" Draw

International PK18 18" Sq. Cyl 8" Draw 24 x 36 Table

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International "F" 45 x 72 x 16" Draw
J&J 612, 25 x 30 x 8" Draw
J&J 815, 30 x 40 x 15" Draw
J&J 918 44 x 54 table, 18" Draw
Osborn 405 39 x 63 table
Osborn 242W
SPO 508, 28 x 30 x 9" Draw
Tabor 30 x 50 x 12" Draw Shockless

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J&J 12168, 36 x 54 x 16" Draw
J&J 688, 24 x 30 x 6" Draw
Milwaukee 1536, 32 x 38 x 10" Draw
Osborn 558 20" x 24" x 5" Draw
SPO 3076

JOLT SQUEEZE ROLLOVER DRAW
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SPO 920, 32 x 44 Flask 11" Draw
Osborn 332, 26 x 36 Flask 9" Draw

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Tabor 48" x 60"

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Simpson Portomuller
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Simpson #2 w/skip (open gear)
Simpson #2 UD w/aerator and skip hoist
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B&P #60 w or w/o Multromatic
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Clearfield 920 w/skip
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B&P No. 60 Preparator
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1 Reddy Sandy

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Simplicity 3 x 5
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Allis Chalmers 8 x 10
Simplicity 4 x 6
Simplicity 6 x 8

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B & P Flexiblo, Model No. CB-10-DH w/ Universal Blo Plate

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American #2 Multi table
42 x 48 American Wheelabrator
36 x 42 American Wheelabrator with skip & dust collector
27 x 36 American Wheelabrator with skip & dust collector
20 x 20 Air Blast Sly Barrel
No. 3 Pangborn continuous Wheelabrator with feeder & dust collector
36 x 72 Sly Tumbling Barrel, gearmotor drive
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American N2 Multi Table 9' w/Dust Collector
American 20 x 27, with Rubber Belt

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U. S. No. 65, variable speed 24"
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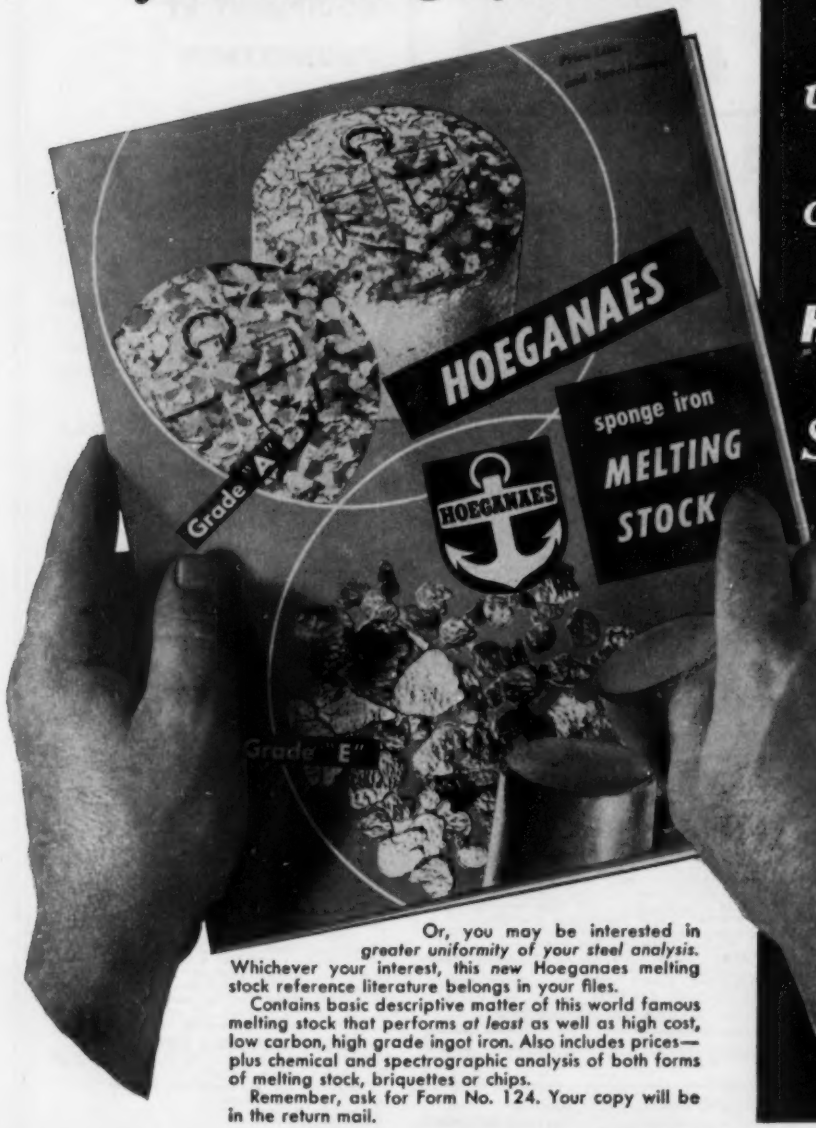

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Advertising Index

Acme Foundry Co. 136
Adams Co., The 44
Ajax Magnethermic Corporation 97
Allis-Chalmers 163
Almco Queen Products Division, King-Seeley Corporation 189
American Smelting & Refining Co., Federated Metals Division 111
American Steel & Wire Division of United States Steel 5
Archer, Daniels, Midland Co., Federal Foundry Supply Division 6, 7, 185
Atlantic Abrasive Corporation 185

Bailey, William M., Co. 164
Bay State Abrasive Products Co. 24, 25
Beardsley & Piper Division of Pettibone Mulliken Corporation 53, 177
Bellows-Valvair Division of International Basic Economy Corporation 16
Benedict Chemicals, Inc. 189
Berkshire Chemicals, Inc. 200
British Cast Iron Research Association, The .. 104
British Moulding Machine Co., Ltd. 113
Brown Boveri Corporation 153

C & S Products Co., Inc. 155
Campbell-Hausfeld Co., The 187
Carman, Edwin S., Inc. 188
Caterpillar Tractor Co. 14, 15
Centrifugal Casting Machine Co. 188
Chain Belt Co., Carrier Division 119
Chicago Pneumatic Tool Co. 105
Clearfield Machine Co. 147
Cleveland Chaplet & Mfg. Co. 178
Cleveland Flux Co., The 139
Cleveland Tramrail Division, The Cleveland Crane & Engineering Co. 183

DeBardeleben Coal Corporation 188
Delta Oil Products Co. 171
Demmler Manufacturing Co. 143
Desmond-Stephan Manufacturing Co. 160
Detroit Electric Furnace Division of Kuhlman Electric Co. 42, 43
Detroit Testing Machine Co. 116
Diamond Alkali Co. 186
Dietert, Harry W., Co. 11
Durez Plastics Division of Hooker Chemical Corporation 148, 149

Eastman Kodak Co., X-Ray Sales Division 137

Fanner Manufacturing Co., The 46, 47
Federated Metals Division, American Smelting & Refining Co. 111
Ferro Corporation, Louthan Manufacturing Co., Division 10
Foseco, Inc. 32
Foundry Educational Foundation 201
Foundry Equipment Co., The 36
Foxboro Co., The 161
Fremont Flask Co., The 168

Gardner-Denver Co. 145
Goodrich, B. F., Chemical Co. 2
Gray Co., Inc. 184
Great Lakes Carbon Corporation 56
Great Western Mfg., Co. 184
Grinding & Polishing Machinery Corporation 180

Hanna Furnace Corporation, The 54, 55
Hannifin Co., A Division of Parker Hannifin Corporation 146
Hartley Controls Corporation 189
Hevi-Duty Electric Co. 169
Hines Flask Co., The 88
Hoeganaes Sponge Iron Corporation 198
Hooker Chemical Corporation, Durez Plastics Division 148, 149
Hough, Frank G., Co., The 172

Inductotherm Corporation 179
Ingersoll-Rand Co. 166
International Automation Corporation 99
International Basic Economy Corporation, Bellows-Valvair Division 16
International Nickel Co., Inc., The 1

Jeffrey Manufacturing Co., The 48
Johns-Manville 87
Johnston Manufacturing Co. 144

Kaiser Aluminum & Chemical Sales, Inc., Kaiser Refractories & Chemicals Division 101
Kaiser Refractories & Chemicals Division, Kaiser Aluminum & Chemical Sales, Inc. .. 101
Kookuk Electro-Metals Co. 178
King-Seeley Corporation, Almco Queen Products Division 189
King Tester Corporation 186
Knight, Lester B., & Associates, Inc. 106

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For More Information Circle 687, Page 39

Advertising Index

Koppers Co., Inc. 93
Krieg, Victor J., Inc. 158
Kuhlman Electric Co., Detroit Electric Furnace Division 42, 43

Latella, D. C., & Associates, Inc. 187
Lindberg Engineering Co., Heat Treating Furnace Division 123
Logan Co. 159
Louthan Manufacturing Co., A Division of Ferro Corporation 10

Martin Engineering Co. 188
Mathews Conveyer Co. 12
Mayer, Carl, Corporation, The 115
Metal Blast, Inc. 181
Michigan Oven Co. 185
Modern Equipment Co. 202
Murphy, James A., & Co., Inc. 188

National Acme Co., The 130
National Engineering Co. 28
Newaygo Engineering Co. 33
New York & New Jersey Lubricant Co. 132
Nomad Equipment Corporation 124

Ohio Ferro-Alloys Corporation 107
Oilgear Co., The 27
Olin Mathieson, Metals Division ..... Back Cover
Osborn Manufacturing Co., The 90, 91

Pangborn Corporation 95, 157
Parker Hannifin Corporation, Hannifin Co., Division 146
Penn Iron Works, Inc. 184
Pettibone Mulliken Corporation, Beardsley & Piper Division 53, 177
Philadelphia Quartz Co. 182
Pickands Mather & Co. 127
Picker X-Ray Corporation 200
Pittsburgh Coke & Chemical Co. 120

Raybestos-Manhattan, Inc., Asbestos Textile Division 34
Reda Pump Co., Furnace Division 116
Redford Iron & Equipment Co. 133
Reynolds Metals Co. 8, 9
Royer Foundry & Machine Co. 129
Rudow Manufacturing Co. 189

Scientific Cast Products Corporation, The 186
Security Alloys Co., Inc. 180
Shepard Niles Crane & Hoist Corporation 138
Sherritt Gordon Mines Limited 52
Sidley, R. W., Inc. 189
Simonds Abrasive Co. 45
Simplicity Engineering Co. 134
Smillie, C. M., & Co. 187
Smith, Werner G., Inc. 125
Spencer Turbine Co., The 152
Spo, Inc. 35
States Engineering Corporation 189
Steel City Testing Machines, Inc. 158
Stevens, Frederic B., Inc. ..... 154, Inside Back Cover

Tabor Manufacturing Co., Division of Turbo Machine Co. 30, 31
Taccone Corporation 13
Taylor, Charles, Sons, Co., The 173
Timken Roller Bearing Co., The 22
Turbo Machine Co., Tabor Manufacturing Co., Division 30, 31

Union Carbide Corporation, Union Carbide Metals Division ..... Inside Front Cover
Union Carbide Corporation, Union Carbide Plastics Co., Division 41
United States Graphite Co., The, Division of The Wickes Corporation 140
United States Steel, American Steel & Wire Division 5
Universal Clay Products Co. 122

Vanadium Corporation of America 117

Wheelabrator Corporation 49, 50, 51
Whitehead Brothers Co. 21
Whiting Corporation 108
Wickes Corporation, The, The United States Graphite Co., Division 140
Woodward Iron Co. 174

Classified Advertising 190, 191, 192, 193, 194, 195, 196, 197

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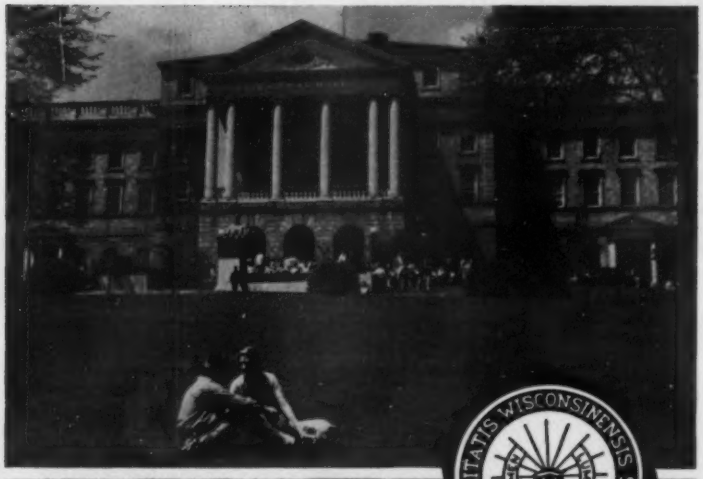

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The main campus, graced by Bascom Hall, and considered one of the most beautiful in America, is located within the city of Madison. More than 16,000 students are enrolled on the Madison campus. Total enrollment is above 20,000. With three basic colleges, five professional schools and 86 departments, the University of Wisconsin opens the door to almost every major field of study. More than 70,000 Badger alumni can be found throughout the world.

Metal Casting Laboratory

The Metal Casting Laboratory, a facility of the Mining and Metallurgical Engineering Department is located in a separate building with approximately 54,000 sq. ft. of floor space. It is designed and fully equipped for instruction and research in all phases of foundry engineering. Students receive training in the basic and engineering sciences, and go on to the application of these fundamentals to problems encountered in foundry practice through several basic and advanced cast metal courses.

Currently the Department is headed by Professor Phillip C. Rosenthal (left) assisted by Professor Richard W. Heine (right). These two men are internationally recognized for their achievements in the cast metals field.

Graduates in Many Foundries

Wisconsin was one of the first five schools to affiliate with the FEF when it was organized in 1947. About 280 students specialize in foundry courses each year. Many deserving young engineers are granted Scholarships and Fellowships. Wisconsin graduates can be found in responsible positions in the foundry industry throughout the nation.

FOUNDRY EDUCATIONAL FOUNDATION, Terminal Tower, Cleveland, Ohio

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MODERN

40TH YEAR

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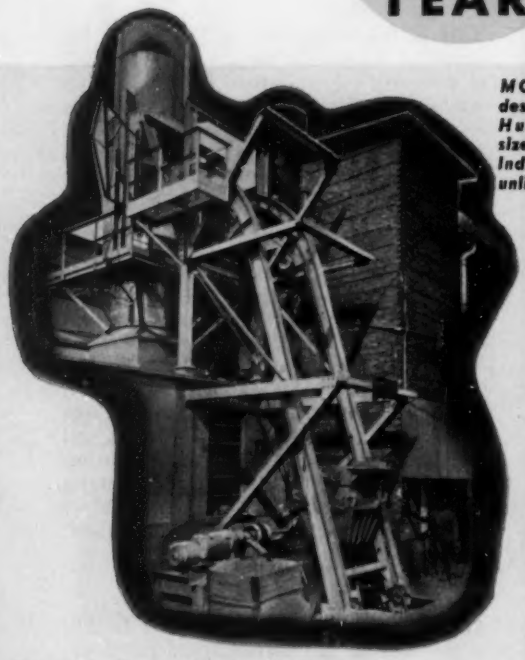
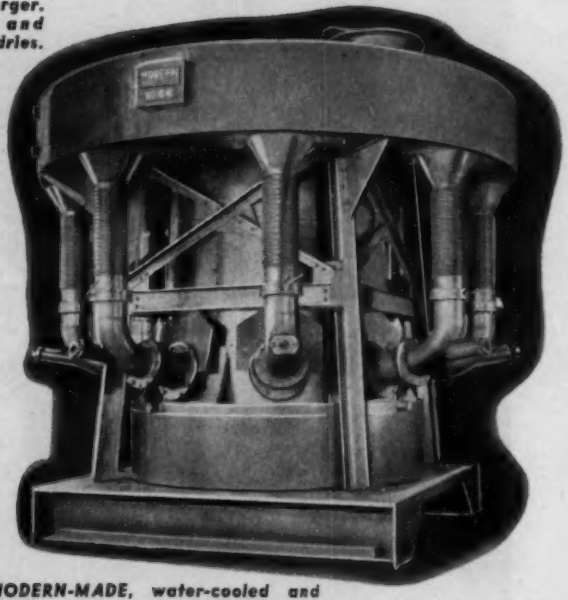


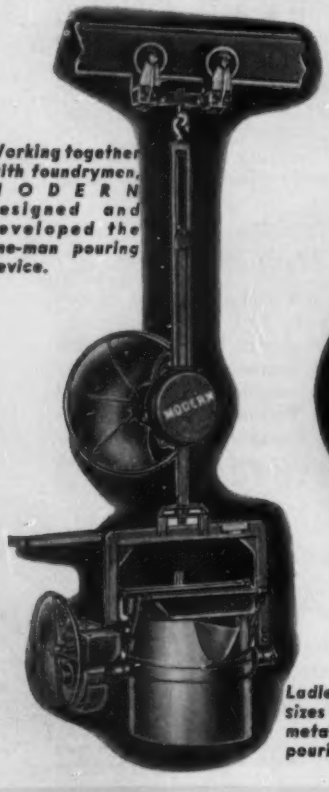
Cranes, trolleys and monorail systems are engineered to specific needs.

MODERN pioneered in designing the skip charger. Hundreds of types and sizes now serve foundries. Individual designs are unlimited.

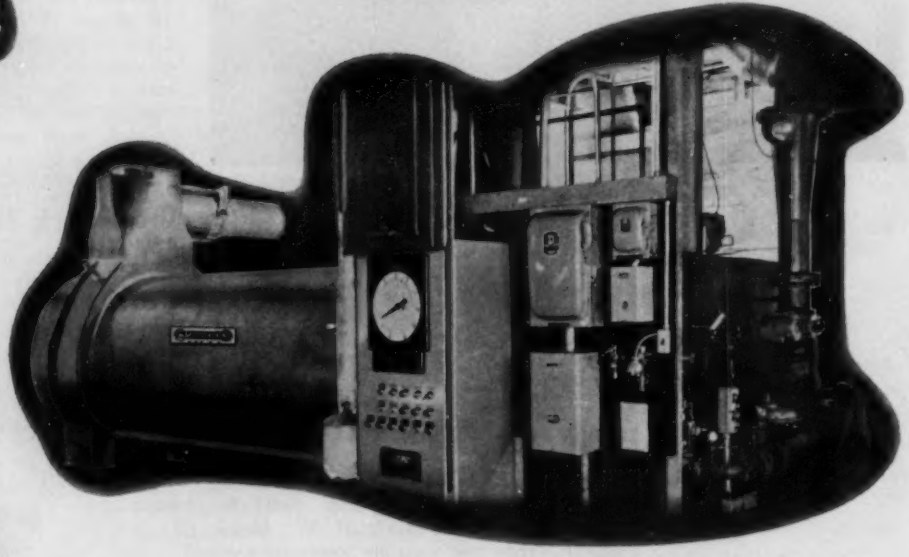


MODERN-MADE, water-cooled and standard cupolas do the melting for most of the nation's foundries.

Working together with foundrymen, MODERN designed and developed the one-man pouring device.



Ladles of all types and sizes are engineered to metal loads and to pouring conditions.



MODERN, cost-cutting equipment includes recirculatory hot blast heaters. Efficiencies range to 85%.

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MODERN EQUIPMENT COMPANY, Dept. F-4 Port Washington, Wis.

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SUPER-KORFAST CORE PASTE

NEW FORMULA – water-mixes and *stays* smooth and creamy over a wide consistency range. No puddle-down . . . stands up to bridge spaces between core surfaces.

NEW ECONOMY – thinly compressed joints use less paste . . . provide more accurate dimensions . . . dries faster, minimizes gas, low water absorption.

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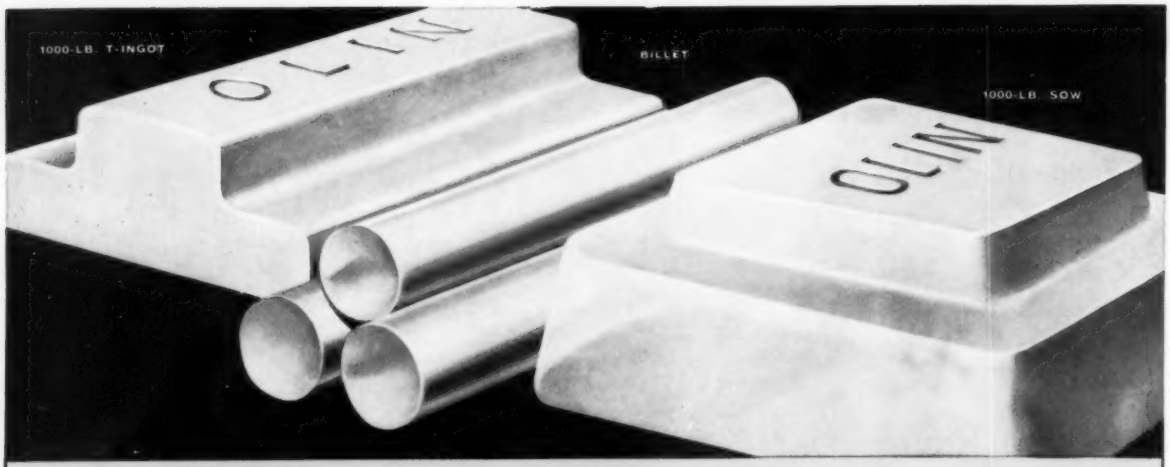
EVERYTHING FOR A FOUNDRY



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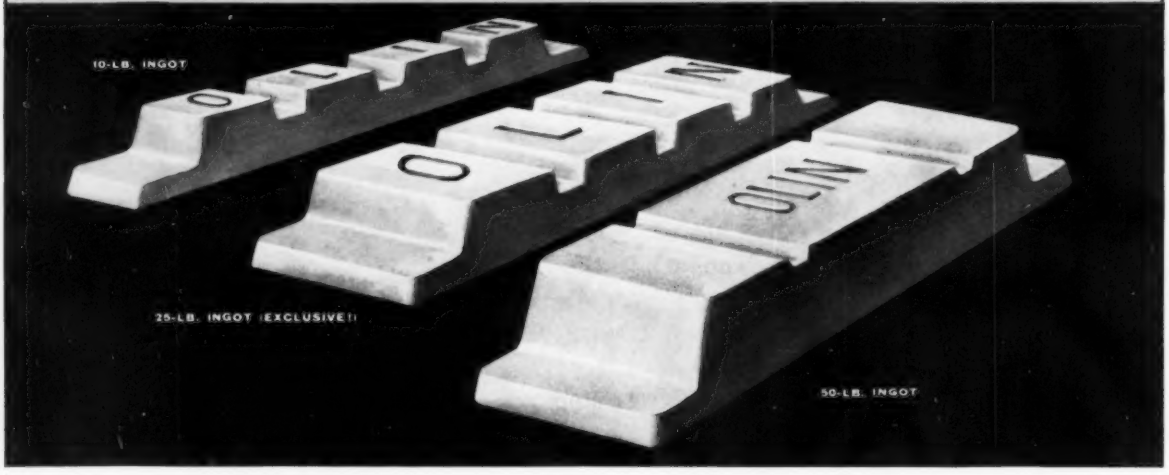

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